Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Management (FEM)

Diploma Thesis

EFFECTIVE MANAGEMENT STRATEGIES FOR INNOVATIVE TECHNOLOGY TRANSFER IN THE RUSSIAN FEDERATION IN COMPARISON TO THE CZECH REPUBLIC

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DIPLOMA THESIS ASSIGNMENT

Anna Esich

Economics and Management

Thesis title

EFFECTIVE MANAGEMENT STRATEGIES FOR INNOVATIVE TECHNOLOGY TRANSFER IN THE RUSSIAN FEDERATION IN COMPARISON TO THE CZECH REPUBLIC

Objectives of thesis

An identification of the mechanism of innovation technology transfer and to elaborate the management strategy for development and enhancement of efficiency in the Russian Federation in comparison to the Czech Republic

Objectives:

- overall analysis of the origin of the technology transfer process;
- study the national innovation system of the Czech Republic;
- evaluate the socio-economical process of technology centers in the Russian Federation;
- develop a strategic plan for effective execution and expansion for Russian technology transfer system;
- overview and appraise the perspective development.

Methodology

The subject of investigation is the strategic management organization of technology transfer.

The object of investigation is the technology center's system as a whole.

The methodology of the research:

– literature research (complete research, specifically comprehensive research) allows to explore areas of investigation and help to write the theoretical part, factual research comprises specific statistic data, resources, and other information for practical part of investigation;

– synthesis (relational, mathematical, statistical and regression analyzes) would be relevant in the analysis of the national innovation systems and technology transfer system more accurately and successfully;

– method of comparison allows to make the identification of identical and varying aspects of technology transfer system both countries in practical part of diploma thesis.

The proposed extent of the thesis

Approx 60 pages

Keywords

innovation technologies, research and development, technology transfer, national innovation system, innovation diffusion, strategic management.

Recommended information sources

Anderson M., Technology Transfer: Law and Practice, Bloomsbury Professional; 3rd edition 2010
ATTC Network, The Change Book: A Blueprint for Technology Transfer, 2013
Speser P.L., The Art and Science of Technology Transfer, 2006

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Declaration

I declare that I have worked on my diploma thesis titled "Effective management strategies for innovative technology transfer in the Russian Federation in comparison to the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 30.03.2016 …….

Anna Esich

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I would like to express the deepest appreciation to my scientific supervisor Ph.D Richard Selby for all his advice, valuable recommendations and continuous support during my work on this thesis.

I would also like to thank the academic staff of the Faculty of Economics and Management at the Czech University of Life Sciences for their help and support.

"Efektivní strategie v řízení inovačního transferu technologií v Rusku ve srovnání s ČR"

Souhrn

Vytváření inovativní ekonomiky založenou na nových poznatkach, nových technologii, a nových formach řízení, je základem dlouhodobého sociálně-ekonomického rozvoje Ruské federace. Účinnost inovačního procesu by měla být určena efektivitou její nástroje - transfera technologií, která je základem pro národní rekonstrukci a hospodářský růst.

V České republice, rozvoj transferu technologií a komercializaci systému probíhá přes několik dekád. Srovnáme-li české inovační infrastrukturu s ruskou, je zřejmé, že zahraniční zkušenosti v oblasti inovací dokážou překonat absencí dobře fungující inovační infrastruktury v Ruské federaci, která se skládá z technologických parků, fondů rizikového kapitálu, transferu technologií a inovativních firem.

Diplomová práce vysvětluje význam české zkušenosti v oblasti transferu technologií při používání v ruské praxi. Výsledky výzkumu pomohli identifikovat klíčové strategické oblastí: vnitřní zlepšení transferu technologií a spolupráce veřejných i soukromých organizací na podporu přenosu technologií, interakce s zemí BRICS, podporu investic a rozvoje práv k duševnímu vlastnictví.

Klíčová slova: inovační technologií, výzkum a vývoje, transfer technologií, národní inovační systém, inovace difúze, strategické řízení.

"Effective management strategies for innovative technology transfer in the Russian Federation in comparison to the Czech Republic"

Summary

Creating an innovative economy based on new knowledge, new technology, new management forms is the basis for long-term socio-economic development of the Russian Federation. The effectiveness of implementation of innovation process shall be determined by effectiveness of its instrument - **technology transfer** that is basic foundation for national recovery and fast growth of economy.

In the Czech Republic the development of technology transfer and commercialization system had been apparent for several decades. Comparing Czech innovational infrastructure with Russian, it's obvious that foreign experience in the innovational area can cope with lack of well-functioning innovational infrastructure in the Russian Federation, which consists such master links as tech parks, venture funds, technology transfers and small innovational companies.

The Diploma Thesis explains the importance of the Czech experience in the field of technology transfer in application in Russian practice. Research findings helped to understand the main strategy directions: internal improvement of technology transfer, support cooperation of public and private organization, cooperation with BRICS countries, investment and intellectual property development.

Keywords: innovation technologies, research and development, technology transfer, national innovation system, innovation diffusion, strategic management.

List of abbreviations

BCG – Boston Consulting Group;

BRICS – Brazil, Russia, India, China and South Africa;

CATU - Closed Administrative- Territorial Unit;

EU – European Union;

GDP – Gross domestic product;

IP – Intellectial property;

IPR - Intellectial property rights;

NIS – National Innovation System;

R&D – Research and Development;

SME – Small and Medium Enterprises;

TIZ - Technological and Innovation Zone;

TT – Technology Transfer.

Table of content

1 Introduction

The increasing pace of scientific and technological advance and rising intellectualization of basic factors of production characterize the contemporary stage of global economic development. Intensive carrying out R&D based on the new technologies, entrance into international markets and expansion of international integration in research-and-production field within the framework of emerging global economic have become strategic model for industrial developed countries.

Innovation model of economic development has become reference point for Central and Western Europe and Russia. It allows enhancing rate of economic growth, integrating in global economic space efficiently, accomplishing socio-economic tasks successfully including narrow the gap in per capita GDP as compared to developed countries. Individual countries of Europe have already achieved certain results in this direction. For the past two decades it were able to partially restore pre-reform positions, increase the growth of industrial production, raise the technological efficiency of export by limiting share of commodities. For example, in the Czech Republic, Hungary, Poland and Slovakia was particularly noticeable the growth of export of high-tech industries such as aerospace, electronic, chemical-pharmaceutical industries, production of vehicle for communication and sophisticated instruments. Technological readiness leads to high level of labor productivity, output quality agreeable to the international standards and, as a consequence, competitiveness in foreign markets.

In the case of Russia, prolonged transformational crisis and a ten-year period of experiments in the economy run to destruction of basic elements of scientific-industrial potential and dramatic decline in the values of R&D. In modern industry old technologies completely dominate and contemporary achievements of science are poorly used. The number of enterprises engaged in innovation is unable to satisfy a customer demand and continue to produce goods are considerably underrepresented in comparison with their international peers.

Commodity economy common for the several countries makes them dependent from conjuncture of world oil prices and provides technological backlog at the international market of innovations and high technologies. Russia's relation of export energy products and raw materials has already achieved critical level that creates the economic security threat. Country's economy is becoming weaker as affected oil price

reduction, outflow of foreign investments and forces import which is the evidence of that the country should go in the direction of technological upgrading and new technologies development.

Russian innovation economy should be based on innovation infrastructure and support institutions of small and middle enterprises such as legislation regulation of relations in innovative field, technology transfers, educational centers, investment and financing organizations. Under the modern conditions the Russian Federation has acute need to decrease the importance of commodity export, take place in international division of intellectual labor, modernize of production facilities, produce high technology, encourage innovations and make smart economy.

2 The objectives of research

Under conditions of eliminating consequences of economic crisis the Russian Federation faced many serious challenges to provide a lasting access strategy for domestically produced high technologies to global markets. Fundamental criteria of innovation development is functioning of technology transfer is understood as transmission system of R&D results in order to use different objects of intellectual progress - inventions, production pieces, software and etc. In global experience, technology transfer is the one of instruments of innovation transformation of national economy. That is why the transfer of technology is defined as one of the business priorities of state innovation policy and special national interest.

The Russian Federation is endowed with everything for rapid modernization by virtue of technology transfer. Worthy engineering specialists and scholar school are still converse, there are a plenty of reserve of industrial infrastructure, fairly developed internal market and raw materials base. However, in spite of all existing advantages for development, the main barrier to development of technological export is low competitiveness, obsolete and outdated system of technical standards, fungus and slow-moving process of concordance and authorization, high level of governmentalisation, lack of cheap financing of industrial investment projects and difference between costs of innovations and commercial effect of realizing them. Innovation and technological potential of Russia being poorly implemented in the framework national economy.

The technology transfer as a whole becomes an **object of investigation**. The **subject of research** is the management of the technology transfer.

Hypothesis: Experience of the Czech Republic in the technology transfer management is the perspective way to reduce the technological gap for enhancing the competitiveness and to improve the national innovation systems of the Russian Federation.

Main aims of this research work are an identification of the mechanism of technology transfer and to elaborate the management strategy for development and enhancement of efficiency in the Russian Federation in comparison to the Czech Republic.

These aims can be achieved through the set of sub-goals:

- overall analysis of the origin of the technology transfer process;
- study the innovational infrastructure and technology transfer system of the Czech Republic;
- consider the role and place of technology transfer in innovational economy in the Russian Federation;
- indicate the main problems and disadvantages of Russian technology transfer functioning;
- develop a strategic plan for effective execution and expansion of Russian technology transfer system based on experience of the Czech Republic;
- overview and appraise the perspective development of technology transfers in the Russian Federation.

To present day the issue of technology transfer is examined at some insignificant degree but the importance is increasing permanently within the framework of NIS and in the context of world economy development. The Russian Federation as a country with economies in transition are faced the challenge of forming innovative economy and integration into world economy based on new principles, which is possible only on the assumption of generation of effective nations innovation politics, intensive utilization and reproduction of scientific and technological potential in the line of improvement in the competitiveness with relation to long-term technical and economic advancement.

3 Methodology of investigation

There are number methods and analytical tools have been used in this paper in order to achieve the objectives: **literature research, mathematical method, method of comparison and SWOT-analysis.**

The literature research included the scientific works and development of Russian and foreign scientists on the problem of innovative technologies, innovative entrepreneurship and technology transfer. Despite the recently published scientific works by Russian scientists, it should be stated that foreigh economists have begun much earlier study of the economy based on the use of innovation and further advanced in the this area. It works by M. Porter, B. Clark, I. Schumpeter, B. Santo, V. Hartmann, B. Twiss, P. Drucker, C. Gross, M. Keup, E. Roberts, A. Thompson, R. Rumelt, A. Chandler, D. Lehmann and others.

Empirical base of the literature research consists of:

– official documents of the authorities, organizations and institutions such as National Innovative Strategy, Annual Innovative Report;

– statistical data as Federal State Statistical Service, Czech Statisctical Office etc.

Countries should have sufficient innovative capacity for innovative activity. Therefore, the **mathematical method** for estimating the country's innovation potential is essential. According to Anderson and Warner, it is encouraged to use functional evaluation model for the assessment of innovative activity and competitiveness. As the main indicators are selected following:

- domestic expenditure on R&D as a percentage of GDP (X1);

- the share of employment in research and development as a percentage of total employment (X2);

- the share of R&D fixed assets in their total cost (X3);

- the cost of technological innovation as a percentage of GDP (X4).

Functional model of the innovative potential and competitiveness of the countries of the following form:

$$\mathbf{R = 0,3\ X1 + 0,2\ X2 + 0,2\ X3 + 0,3\ X4}$$ (Anderson, Warner, 2010).

The proposed system of indicators makes it possible not only to analyze the innovation and determine the amount of innovative potential of countries, but also to

identify opportunities and reserves of regional economic growth, to determine the direction of public policy in promoting innovation development of regions. This approach is necessary because of the innovative potential of a country is a complex of innovative elements in the multipurpose and multifaceted relationship. The advantage of the integral index is the fact that it covers all the basic capabilities and components as much as possible given in comparable form.

Method of comparison requires identification of identical or varying aspects of innovative activity of the Czech Republic and the Russian Federation. The innovative infasrtucture should be evaluated by the following order:

- Gloval Innovation Index of the country[1];
- Innovation performance;
- Number of innovative organization;
- Government expenditures;
- Human resources in the field of R&D;
- External trade;
- Government development program;
- Legislation acts;
- Technology transfer system;
- Patent activity;
- Investment opportunities.

SWOT – analysis includes four major components: strengths, weakness, opportunities and threats. Pairwise, these characteristics are either external or internal factors influencing the activity of technology transfer (Figure 1). Based on this method of analysis of the effectiveness of technology transfer will occur in two phases: the first phase – to assess the strengths/weaknesses of the technology transfer system; on the second – to estimate opportunities/threats of the innovative infrastructure.

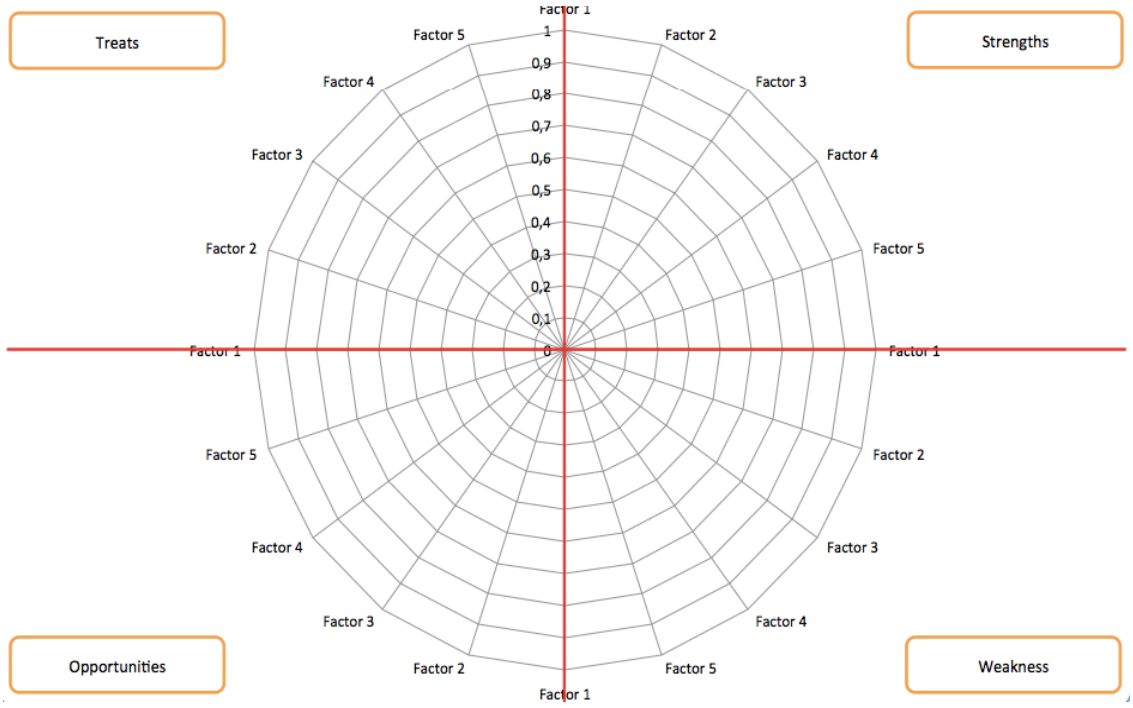
[1] Ranking the world's countries and economies through innovational measures, environments, and outputs.

Figure 1 – Sample of SWOT – analysis

	Positive	Negative
Internal origin (attributes of the technology transfer)	**Strengths** areas technology transfer do well or advantages of your organization;	**Weaknesses** external factors that may contribute to technology transfer and can build up strehgths.
External origin (attributes of the environmental)	**Opportunities** areas to be improved;	**Threats** potential problems/risks caused by external factors that your organisational may face.

For visualizing it is necessary to create SWOT- chart for selecting the total estimation of identified factors (Figure 2).

Figure 2 - Chart of SWOT - analysis



After construction of SWOT-matrix and SWOT-chart it's necessary to determine what strengths can be used by technology transfer to achieve maximum opportunities available on the market and what weakness can be eliminated in order to avoid threats that exist on the market.

All methods are aimed at a qualitative and quantitative assessment of the innovation potential and technology transfer's system of the Czech Republic and the Russian Federation, conducting comprehensive comparative analysis for effective use of the Czech innovative experience for the solution of problems and shortcomings in the Russian innovation infrastructure.

4 Theoretical backgrounds of innovational technology transfer and strategic management

4.1 The basis of technology transfer

4.1.1 The concept of technology transfer

Effectiveness of using intellectual, innovation and resource potential depends on economical source for the development, adaptation and upgrading main market mechanisms, structural change of industry and institutional reorganization. On the modern stage of world economic development TT is an only source of economic independent because it provides strategic opportunities to business entity in the sphere of internal market development, new growing areas and adaptation achievements in in the more developed countries.

Authorities have had similar difficulties defining “technology transfer”. There has been a general consensus that any workable definition of transfer must be functional rather than formal. According to the Oxford dictionary, TT is a process of transferring of new technology from the originator to a secondary user, especially from developed to less developed countries in an attempt to boost their economies (Oxford dictionaries, 2016). According Frascati Manual, TT is a transmission of knowledges and experience for to provide scientific and technical services, application of technological processes and product release (Oslo Manual, 2006). In so many words TT is a successful application and adaptation of innovation technology developed by one organization for need of another company or physical person. This description doesn't treat TT as commercial phenomenon because transfer can serve the increasing the amount of knowledge and know-how one of the parties without financial transactions.

Nowadays one of the perspective directions of activities of private financial agencies is complex investment, marketing and management accompaniment of commercialization projects and TT. In this case process of transfer is a part of commercialization process is required for promotion of science intensive and innovation products to internal and external markets. Creation of balanced system of technology transfer provides reliable barrier for selling new technologies very cheaply. In that way for the development the country's economy necessary to increase a speed of transferring unique and progressive technologies, attract financial resources for activation of

innovation activity.

4.1.2 Technology transfer models

The researchers have offered so many TT models and methodologies, since the early 1970s. These models involve both quantitative and qualitative models. They are able make easy the effective planning and implementation of transfer project. In 1971 year Samuel Bar-Zakay proposed the model on a project-management approach. In this model there is division between stages of TT process into search, adaptation, implementation, and maintenance. The author also indicated the importance of technological forecasting, long-range planning and project related intelligence of transferor (donor) and recipient (Bar-Zakay, 1970). The main disadvantage of this model that it doesn't relevance modern economy because a majority of the activities a reflected the setting of the early 1970s, when buyers of technology were mainly passive recipients who depended greatly on aid programs for the purchase of technology.

In 1976 in the frame of The Behrman and Wallender Model were proposed seven stages for international transfer that more relevant to multinational corporations. According to this model, the production plan and planning decision for position is the most important step. Then is to decide the product design technologies to be transferred. And then is to illustrate the details of the factory that is designed to produce product and others. Thus, the factory construction and production start-up can be operated. After start-up, to adapt the process and to strengthen the production systems to fit the local conditions are necessary. Next is to improve the product technology transferred by using local skills. Finally, provides the external support to strengthen the relationship with the transferor and transferee (Speser, 2006). Afterwards Dahlman and Westphal which emphases a lot on transferee involvement in all the stages of the technology transfer improved this model (Audretsch, Lehmann, Link, Starnecker, 2012).

According to the Sharif and Haq model there was proposed the concept of potential technological distance between transferee and transferor in 1980. This model argues that in case when the potential technological distance is either too great or too small, the effectiveness of the transfer is low. The authors have estimated the “optimal distance”, which can be relevant for a potential transferor (Sharif, Haq, 1980). In three year technological “catch-up” model that was aimed at enhancing of previous model,

illustrates that how a technology leader could assist the rate of the technology development for a technology follower via the TT. This model mainly tests three stages of the growth of the transfer: the slow initial stage with high technological capability gap; the faster learning stage with the decreasing gap; and the catch-up stage when the technological gap is very small or even closed (Raz, Steinberg, Ruina, 1983). This model is very useful in application because it could help the technology leaders to develop a clear policy according to the consideration of the competitiveness, security and others.

To present day the issue of TT models is examined at some insignificant degree but the importance is increasing permanently within the framework of NIS and in the context of world economy development. Countries with economies in transition are faced the challenge of forming innovative economy and integration into world economy based on new principles, which is possible only on the assumption of generation of effective nations innovation politics, intensive utilization and reproduction of scientific and technological potential in the line of improvement in the competitiveness with relation to long-term technical and economic advancement.

4.1.3 Valuation methods of transfer effectiveness

In recent years, a series of research studies were executed aimed at measuring the efficiency of technology transfer system. Newer studies of processes related to the technology transfers include issue of involvement of the academic staff in technologies commercial (Owen-Smith, Powell, 2003), licence strategy of technology transfer (Bercovitz, Feldman, Feller, Burton, 2001), country's policy in the field of intellectual property commercialization (Goldfarb, Henrekson, 2003), link technology transfer with institutes of higher education (Rothaermel, Thursby, 2005), ethical issues of technology licensing (Jensen, Thursby, Thusby, 2001) and factors making effects on rate of invention's commercialization (Markman, Gianiodis, Phan, Balkin, 2005).

As demonstrated by a series of research studies, success of intellectual property commercialization depends on institutional structure of technology transfer; it's organizational capabilities and incentive systems of personnel. Continuing this line of investigation scientists Donald Siegel, David Waldman and Albert Link (Siegel, Waldman, Link, 2006) have presented quantitative and qualitative data reflecting effectiveness of TT on the basis of the outcomes of sociological questioning was

conducted by AUTM[2] with depth interview with 100 specialists in the field of technology transfer. Authors arrived at a conclusion that intellectual property policy and used institutional arrangements potentially could limit or improve technology transfer effectiveness. In particular, they found existence of informational and cultural barriers between universities and small enterprises and also came to a conclusion that attractiveness of TT is low for commercial innovators.

These results adjusted with achievements of the Clark (Clark, 1998) who showed a significance of institutional norms, standards and organizational culture. Based on the results of qualitative analysis of five European TT had produced outstanding results in this field he concluded that existence of enterprise culture was critical success factor. Furthermore, scientist E. Roberts (Roberts, 1991) found out that social norms and informal encouragement were critical determinants of success in TT at the Massachusetts Institute of Technology.

As a point of interest, accessibility level of venture capital in region where technology transfer is located and it's commercial directivity didn't have material impact on the intensity of formation of start-up enterprises (Di Gregorio, Shane, 2003). Researchers Degroof and Roberts (Degroof, Roberts, 2004) have examined importance of start-up policy in such regions where environmental factor, for example, business and technology transfer infrastructure are not conducive to entrepreneurial activity. Authors have proposed system consists of four types of start-up policy.

- absence of start-up policy;
- minimum selectivity and support;
- average selectivity and support;
- comprehensive selectivity and support.

It has been found that comprehensive selectivity and support is optimal policy to create start-up enterprises with higher growth prospects. However, despite of an optimality of this policy, technology transfers not always have resources for its realization in practice. Thus, authors have come to the point that start-up policy influences on the growth potential of the established companies and such policy should

[2] AUTM - is a nonprofit association of technology managers and business executives who manage intellectual property.

be realized at a higher level than separate technology transfer.

In conclusion, effectiveness of TT is determined, first of all, by appropriate organizing system focused on to ensure a implementation process of the findings of R&D into production and posterior diffusion in economy. Formation of effective organizing system of TT based on intensification of interaction between scientific and production system would contribute to creation of competitive high technology, reduction of a share of commodity sector in national economy, improvement of export structure due to the growth of high-tech share and to the reinforcement of Russian position at the world market of technology.

4.2 Conceptual and theoretical fundamentals of strategic management

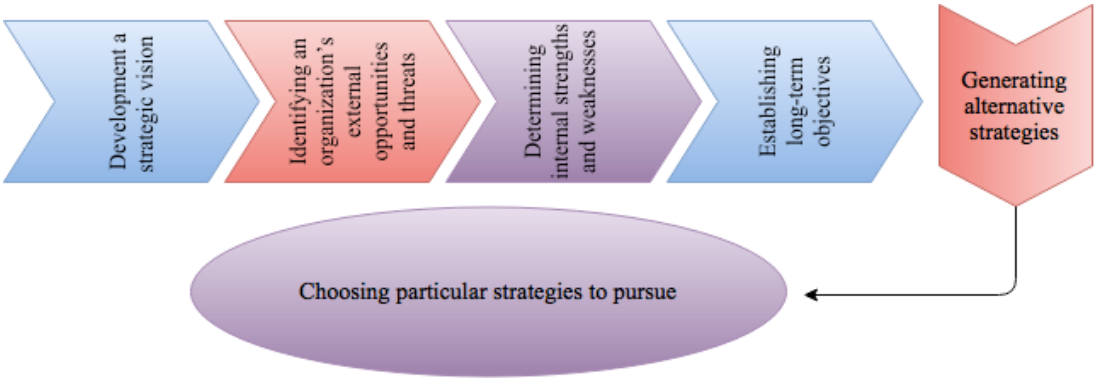
At present time most companies are considering strategic management as a continuous evolutional process and significant of strategic thinking is increasing under conditions of dynamic changes in business requiring radical transition to understanding of strategic processes in company's operation. Strategic management as academic discipline began to form after the book's publication of Richard P. Rumelt «Strategy, Structure, and Economic Performance» in 1974 year (Rumelt, 1974). Next important contributions were made by Michael Eugene Porter in his book «Competitive Strategy: Techniques for Analyzing Industries and Competitors» in 1980 year (Porter, 1980). As far as given discipline is still young and deal with the comprehensive and complex processes of modern business management than there isn't unique determination.

Economist Alfred Chandler was one of the first people who proposed the definition of strategic management as determination of basic long-term goals and the adoption of courses of actions and the allocation of resources necessary for carrying out these goals (Chandler, 1962). According to the Oxford dictionary there is more modern and full definition of strategic management as systematic analysis of the factors associated with customers and competitors (the external environment) and the organization itself (the internal environment) to provide the basis for maintaining optimum management practices. The objective of strategic management is to achieve better alignment of corporate policies and strategic priorities (Business dictionary, 2016). It provides overall direction to the enterprise and involves specifying the organization's objectives, developing polices and plans designed to achieve these objectives, and the allocating

resources to implement the plans.

The strategic-management process consists of three stages: strategy formulation, strategy implementation, and strategy evaluation (David, 2011). **Strategy formulation** is a process of by which a company chooses the most appropriate plan of action to achieve its defined goals. It forces an organization to carefully look at the changing environment and to be prepared for the possible changes that may occur. The process of strategy formulation basically involves six main steps, which are essential to a success of an enterprise, because it provides a framework for the actions that will lead to the anticipated results (Figure 3).

Figure 3 - Strategy formulation process



Source: Thompson, Strickland and Gamble, 2008.

Strategy implementation is an "action stage" of strategic management process. Strategy implementation is also defined as the manner that an organization should develop, utilize and amalgamate organizational structure, control systems and culture to follow strategies that lead to competitive advantage and a better performance (David, 2011). Strategy implementation illustrates the key components and sequencing of effective organizational strategy development and implementation, requires a firm to establish annual objectives, devise policies, motivate employees and allocate resources so that formulated strategies can be executed.

Strategy evaluation is the final stage in strategic management. Strategic evaluation could be defined as the long-term process of determining the effectiveness of a given strategy in achieving the organizational objectives and taking corrective action wherever required. (Butler, Gibson, 2011). The most common tools of assessing strategy are SWOT-analysis, PESTLE-analysis, Porter's five forces and Porter's diamond. (Strategic Choice: Johnson and Scholes Suitability, Feasibility, and Acceptability Model, 2013).

Other analytical methods that can be used include life-cycle analysis, BCG matrix, value chain analysis, positioning of the firm or its products, portfolio analysis, business profile evaluation, gap analysis, and other decision making tools like ranking, decision tree, scenario planning, and sensitivity analysis.

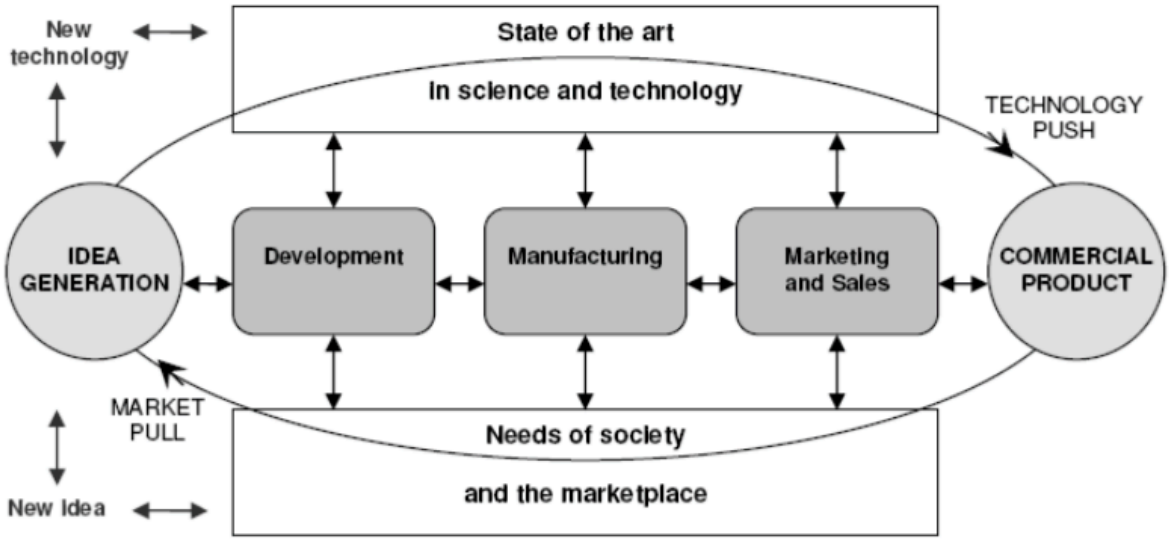
Consequently this model of strategic management is presented as the continuous and dynamic process. The realization of above-listed stages forms a strategic management mechanism of fixed capital of the company based on using of economic dynamics that provided development of approaches and planning technique of the labor instrument production process, analysis and development monitoring, financial and investments.

4.3 Strategic management of technological innovations

Strategic management of technological innovations is a constituent part of the innovation management that has a deal with planning and realization of innovational projects meant for qualitative leap in business undertakings, production and social environment of the company. Strategic management of technological innovations is concerned with using appropriate strategic management techniques and measures to argument the impact of firm's innovation activities on firm growth and performance (Keupp, Palmie and Gassmann, 2011). Generally speaking any strategic measures are innovational because are based on novelties in economy, manufacturing and distribution potentials. Innovation strategical management supposes an integration of technological and investment policy and it is directed at interaction of new technologies and types of production.

On the historical stage of company's development strategy consists of optimum allocation of capital and resources between three spheres of possible changes: development process, manufacturing and marketing. For accurate resource allocation it is necessary to identify demands of all spheres and take into account changes in one sphere may require changes to another: introducing of new technology may cause the changes in the field of production and development of new product requires new marketing methods etc (Figure 4).

Fugure 4 - Strategy of technological innovations according to P. Drucker



Source: Drucker, 2006.

In the general form, a strategy - mainl direction of company's actions which should achieve the stated objective in long-term perspective. Innovational strategy is usually tightly coupled with the principals of entrepreneurial management: entrepreneurial talent, ability to foresight, imagination, presence of initiative and rational and analytical abilities. Besides, major condition for election and implementation of innovational strategy is choice of priorities and following responsibility of high structural unit of management which has obligation of leading hand in strategy accomplishment.

There are several approaches to classification of innovational strategies. Based on foreign experience of innovation management the two major classes of innovational management were distinguished: **defensive and offensive strategies** (Gross, Allen, 2003). And at the same time, every class involves several types of strategies, which are selected by organizations dependent on its macro and microenvironment. The main point of **defensive strategy** comprises in severable non-principal changes allowing improving current products, technological processes and markets. Innovations are regarded as a form of forced response reaction to changes of external environment that fostered preservation of gained market positions. Under conditions of stable commodity-money relations the innovations are, as a rule, initial database in raising the good's competitiveness, expansion and consolidation of bargaining position, adaptation of new field of application, in other words, active mean of business which is maintenance of **offensive**

strategy.

Besides, classical distinctions between defensive and offensive strategies, some authors indicate a series of additional elements of classification. Economists V. Hartmann and V. Shtok examined adaptive strategy as acquisition of license from leading firm and attempt to improve of product, put the similar one on the market providing a lesser costs of production. Under this view, such strategy is charactered by lower costs on R&D and less risk but there is a low probability of earning high revenue. Besides this, the authors are drawing the analogy between this strategy and strategy of innovational imitation which is attempt of accurate copying of second-hand technological idea for the purpose of approaching to competitors and exploring of new possibility of idea's application (Allen, O'Shea, 2014).

Melissa Schilling separated out six types of innovational strategies: **traditional, opportunistic, simulation, defense, dependent and offensive strategies**. The main aim of **traditional strategy** is quality improvement of existing goods and services. Such strategy is realized in stable working environment and under low level of competitiveness. Using **opportunistic strategy** a producer choses the most cost-effective way of R&D providing a monopoly on the market. Its success will depend on existence of complete information about market conditions, high level of technological development and also a presence of fast adaptation of producing to the market changes.

Simulation strategy is orientated at acquisition of new technological ideas, technologies capable to provide rapidly market development based on product release. It requires a presence of relevant financial resources for the purchase of licenses and it also allows becoming a market leader. According to B. Santo the aim of **defense strategy** is keeping pace with competitors in specific area. This strategy is realized with low level of risk because supposed products have already approved on the consumers' market.

Dependent strategy is more characterized for small and middle enterprises interacting with large corporations so the readiness of large producers to transfer new creatures for further expansion is one of the key conditions of this strategy. **Offensive strategy** repulses the main objective of produce to be among leaders in the market. It tends to availability of developed sector of R&D, strong resource base, conducting complex analytical and marketing investigations and highly qualified personnel (Schilling, 2012).

Economist B. Twiss distinguished following diversity of innovational strategies: **offensive, defensive, license, intermediate, brigandish and strategy of a new market**. The author's opinion about **offensive strategy** is differing in that main users that choose this strategy are lower-income groups focusing their attention on several innovational projects. According to this strategy, the main factors of success are top level of proficiency in innovation sphere and rapidly adaptation to the changes. Because of high risk the rapid payback and profit earning attribute this strategy.

According to B. Twiss **defense strategy** is used in the presence of significant market share and profit-earning capacity including the low costs. Under this strategy there are more heavily focused on development than investigations. In this classification licence strategy is interpreted sufficiently traditionally, but author pay attention on necessity to maintain own R&D for following more precise selection of license.

Intermediate strategy allows avoiding a collision of market interest of competitors in the process of identifying of a free niche. In the opinion of B.Twiss an intermediate strategy has to be based on marketing research and high creative activity of personnel. Strategy that Twiss calls **brigandish strategy** supposes a sudden incursion a producer into market. In this case it that might happend contraction of market in the presence of unusual product of the producers. Benefit can be gained in result of consumer's reorientation. **Strategy of a new market** supposes that company is the only produces of new product in in given period. The strategy's effectiveness depends on development of marketing function, quality of marketing researches, innovational activity of personnel and progressive character of company management in matters of perspective development of producing. Companies that realize this strategy become monopolists in the market and cost of development and circulating of innovational technologies will be paid off quickly (Twiss, 1992).

In practice the selection process of innovational strategy assumes an identification of priority sphere that would be play a leadership role in perspective development of organization. Only in case of complex solution of innovational tasks of productive development a success of strategic character is possible. Because at the same time a producer realizes different arrangement are not corresponding to maintenance and orientation of major strategic purpose because they are related to different scope of company's activity.

5 Analysis and evaluation of innovation generation of technology transfer in the Czech Republic

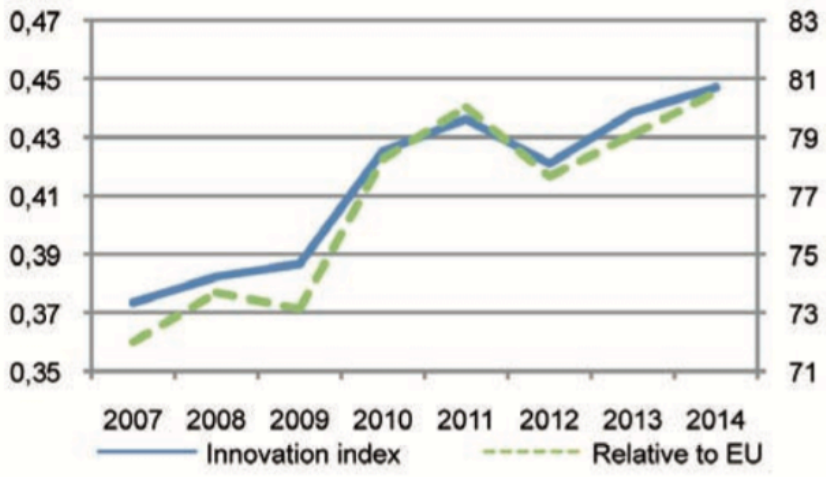
5.1 Investigation of Innovation National System

5.1.1 Innovation infrastructure

Science, reseach and innovation technologies are crucial for economy growth, improvement in the quality of life of society and increases in productivity and sustainable development. The Czech Government is aware of the positive impacts of vibrant R&D of new innovations; it has increased substantially investments into R&D&I and launched an ambitious reform program in order to improve the effectiveness of the system as a whole. According to statistics of 2014 year the Czech Republic has ranked 26th place in innovational performance among other countries and 14th place (50, 2) among EU countries (The Global Innovation Index, 2014).

The international trade across borders of the Czech Republic is the best among 189 different countries. Also the country offers good conditions for doing business (including innovation business) and it hold 36th position among 189 different countries (Doing business, 2015). The Czech Republic is a moderate innovator. Innovation performance has been increasing over most of the period with a decline only in 2012. The performance relative to that of the EU has been increasing between 2007 and 2011 to 80% and, after a decline in 2012, to almost 81% in 2014 (Figure 5).

Figure 5 - The innovative performance of the Czech Republic 2007-2014 years



Source: Innovation Union Scoreboard, 2015

The more detailed information about innovational activity contains in the Table 1. As a whole the number of innovations is increasing from year to year, however negative changes were registered in 2013 year. The large quantity of innovation technologies operates in business enterprises (84% of all innovations), especially private national enterprises that represent 61% of all R&D sector of performance.

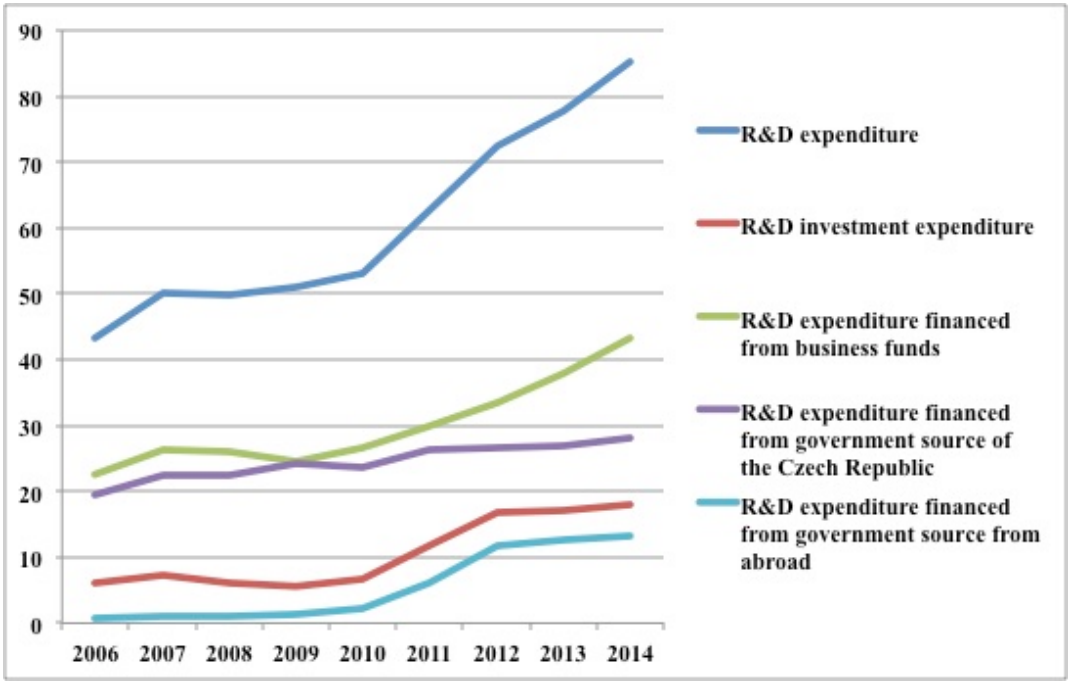
Table 1 – R&D enterpeises by sector of performance, by type of workplace

Sector of performance (R&D), type of workplace	2011	2012	2013	2014
Czech Republic, total	**2 720**	**2 778**	**2 768**	**2 840**
Business enterprise	**2 261**	**2 334**	**2 322**	**2 391**
Public enterprises	64	59	65	73
Private national enterprises	1 660	1 720	1 679	1 749
Private foreign-controlled enterprises	537	555	578	569
Government	**185**	**173**	**176**	**172**
Workplace ASCR	59	60	60	59
Departmental research centers	38	37	37	37
Libraries, archives, museums	59	53	58	56
Other	29	23	21	20
Higher education	**202**	**203**	**208**	**213**
Public and state universities	167	167	168	174
University Hospital	11	11	11	11
Private colleges	24	25	29	28
Private non-profit	**72**	**68**	**62**	**64**

Source: Czech Statistical Office, Research and development (R&D) by sector of performance, by type of workplace of the Czech Republic, 2014.

Official statistical data shows that the research and development expenditures are rising from 1996 year. This year the expenses were 0, 97 % of GDP, in 10 years - 1, 44 % of GDP and finally in 2014 year - 1, 91 % of GDP. For 18 years the R&D expenditures increased by 96 % that is good result in comparison to other countries (Eusostat, Government budget appropriations or outlays on R&D, 2014). More comprehensive information according to R&D expenditure and sources of financing contains in Figure 6.

Figure 6 - R&D expenditure in CZK million



Source: Czech Statistical Office, Research and development (R&D) - territorial comparison, 2014.

Innovational measures of Czech government oriented at SME because about 25 thousand people are working in this sector which is 33% of all workers in the country and 35% workers are closely linked to technological innovations. The considerable proportion of innovational potential of Czech economy concentrates in small and medium enterprises whereas foreign corporations control large-scale enterprises. Under sixth technological mode the amount of personnel in science and technology are increasing from year to year. In 2014 year the total amount of human resources was 6356 persons that is 7 percent above the 2012 year (Table 2).

Table 2 - Human resources in science and technology in persons

Period	2006	2008	2010	2012	2014
Core human resources in science and technology	563,0	594,2	713,3	757,7	841,4
Persons with tertiary education	954,6	1 050,0	1 236,3	1 411,9	1 552,5
Persons employed in science and technology occupations	1 576,0	1 691,5	1 726,6	1 572,9	1 626,3
Human resources in science and technology	1 967,5	2 147,3	2 249,6	2 227,1	2 337,2

Source: Czech Statistical Office, Human resources in science and technology, 2014

Another important criterion of innovational activity is the state of being relevant of domestic production and amount of sale in other countries (Table 3, 4).

Table 3 - External trade by group of high-tech goods in CZK million

Period		2009	2010	2011	2012	2013
Total		**329 392**	**410 231**	**475 962**	**501 751**	**481 284**
Group of goods	Electronics-telecommunications	122 113	140 263	176 484	173 880	172 820
	Electrical machinery	10 149	13 764	16 327	15 044	16 819
	Pharmacy	6 365	7 965	7 424	7 243	9 167
	Chemistry	3 553	3 972	4 419	4 743	4 879
	Aerospace	14 638	9 239	8 731	9 926	12 331
	Non-electrical machinery	11 283	12 694	14 921	17 917	15 637
	Scientific instruments	17 691	19 251	24 405	26 921	28 545
	Computers-office machines	139 976	198 886	219 886	241 282	215 242
	Armament	3 624	4 198	3 367	4 794	5 846

Source: Czech statistical office, External trade in high-tech goods, 2014

Table 4 – External trade in high-tech goods by country – importer in CZK million

By country	EU27		260 833	328 449	377 236	382 436	358 312
	of which	Germany	85 504	123 835	151 667	148 402	134 472
		Netherlands	37 728	39 636	38 295	42 291	31 290
		United Kingdom	28 160	35 545	33 636	35 776	32 810
		France	20 334	22 663	30 970	28 759	27 160
		Austria	9 409	12 584	13 859	13 868	13 159
	Russian Federation		8 640	15 407	18 252	22 064	20 793
	Switzerland		8 183	11 113	13 624	13 997	11 974
	United States		8 014	9 473	11 376	15 687	15 592
	China		3 341	4 668	6 126	6 945	6 089

Source: Czech statistical office, External trade in high-tech goods, 2014

In the Czech Republic issues of development and introducing innovational technologies play an important role in economy. Since the 1990s there were serious structural changes: phased out ineffective and uncompetitive production in globalizing markets (general engineering, mechanical engineering, ferrous metallurgy, individual agricultural industries, glass, textile and tailoring industries). At the same time industries of innovational character were developing such as motorcar construction, electrical engineering, electronics, tourism, chemical and food industries. Besides, in such industries the output of competitive high-tech production with the large share of the value added is increasing to this day. At the same time, in the Czech Republic there is considerable proportion of traditional industries that depends on economic conditions of the country. There were also significant shifts in non-manufacturing business. Previously if at the consuming end the most essential services were distributive industries, tourism, hotel and restaurant businesses that today the most interesting values are consulting, engineering services and trade of results of intellectual activity. Telecommunication services, infotainment and processing, logistics and leasing were also developed for providing functioning conditions of market economies. In the short-term perspective growth rate of such sectors as information technologies, equity market, banking and

innovational funds will increase. These services are claiming in all spheres of economics and acting as guarantor of competitiveness in the global marketplace.

5.1.2 Legislative and support framework

Major normative document defining the main development direction of Czech innovational infrastructure is **National innovation strategy 2012-2020** (Education policies and initiatives of the European Union, 2014). Its conceptual framework is used for activation of R&D processes of innovative technologies till 2020 year. The main aim of NIS is enlarging the spectrum of the application of innovations as a source of consolidation of the country's competitiveness; increase an endowment of high technologies in long-term economic growth, creation of additional workplaces and improvement of life quality in the Czech Republic. National innovation strategy based on recommendations of the EU and corresponds to the fundamental position of European Innovation Strategy in supporting activity of member countries in innovative field.

At present time a significant and opportunities of joint scientific program of the EU is increasing due to market scale, achieved level of integration processes and established institutional mechanisms of innovation processes create favorable prerequisite to realization of stated objectives. In the long term there will be improvement of all-European scientific and technological program as a factor of level equalization of innovational activity and harmonization of innovation priorities of the EU. So the budget of the EU framework programme for research and innovation **«Horizont 2020»** has increased by 46,7% as compared with previous Seventh Framework Programme for Research and Technological Development. Operations of the Programme is orientated at goal achievement of The Lisbon Strategy is aimed at transformation the EU into a knowledge-based, competitive and dynamic economy in the world. Also the «Horizont 2020» promotes implementation of development plan «Europe 2020 Strategy» that represents project for development and economic growth of the EU in long-term perspective (European Commission, Research and Innovation funding 2014-2020, 2014).

In new framework programme «Horizont 2020» special attention is given to commercialization of results of research and scientific findings. For the first time there will be presented continuous support of innovations from idea to market and a single mechanism for support all stages of innovation chain. It also describes the increased

percentage of participation on projects of SME and reduction of level of administrative obstacles owing to simplification of rules and procedures to attract best scientists and innovation companies of a wide variety.

Main forms of government support of innovative activity are tax incentives aimed to promote R&D, higher requirements on skill level of workers and quality of the system for training and retraining staff for international and foreign activity, development of different information funds and systems in the field of science and engineering and providing financial support (subsidies, grants, credits, borrowings, insurance arrangements and contributions in the authorized capital). Also government takes part in the process of demand making using the authoritative management leverages and provides financial support (subsidies, grants, credits, borrowings, insurance arrangements and contributions in the authorized capital) and consulting support, assistance in formation of project documentation.

As a whole, the legislative and support systems of the Czech Republic are developed successfully. On continuing basis the government is updating legislation and supporting programs taking into account the constant changes in business field. Based on operating program **«Entrepreneurship and innovation»** SMEs get sponsorship from year to year. According to Ministry of Industry and Trade of the Czech Republic in 2014 such companies got CZK 10 billions aimed at promoting innovation development of Czech economy.

5.1.2 Patent activity

Analysis of patent activity is very significant to estimate the innovative potential of any country. New technologies are key factor of economic development; therefore scientific and technical competitiveness increasingly determines economic competitiveness. In the advanced countries development and introduction of technological innovation is determinant in social development and economic security. According to World Intellectual Property Indicators in 2014 the Czech Republic took 37th place in ranking of patent activity among 100 countries (World Intellectual Property Indicators, 2014). The level of patent activity is increasing from year to year: in 2014 the number of national granted patents increased by 12,2% from 613 in 2013 to 688 patents (Table 5).

Table 5 - Patents granted in the Czech Republic

Indicator	2010	2011	2012	2013	2014
Total	**4 604**	**5 029**	**5 329**	**5 213**	**5 233**
National granted patents	911	687	670	613	688
European patents validated in the CR	3 693	4 342	4 659	4 600	4 545

Source: Industrial Property Office, Patent and Utility Model databases, 2014

Table 6 - Patent activity according to country of origin

Applicant's country of origin:	2010	2011	2012	2013	2014
Czech Republic, total	**294**	**340**	**423**	**435**	**493**
Business enterprise sector	161	163	202	201	244
Government sector	42	37	48	42	56
Higher education sector	66	108	142	161	165
Private persons	24	32	30	30	28
Foreign applicants, total	**4 310**	**4 689**	**4 906**	**4 778**	**4 740**
EU28, total	2 904	3 136	3 150	2 912	2 990
Germany	1 392	1 524	1 532	1 387	1 433
France	369	399	389	354	332
Italy	246	227	220	266	246
United Kingdom	183	183	176	183	192
Austria	127	143	162	161	148
Netherlands	120	155	139	127	125
Other	467	506	532	435	515
United States	657	727	786	860	806
Switzerland	354	365	389	398	355
Japan	155	196	249	276	230
Other	242	266	333	332	359

Source: Industrial Property Office, Patent and Utility Model databases, 2014

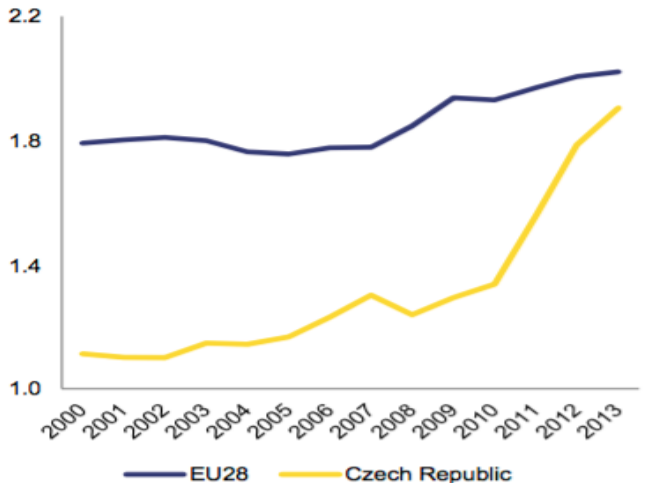
In 2013 the quantaty of patents is 0, 0005 per head. China, as the leader in patent acticity, has the same result proving high involvement of scientific personnel and innovators in R&D and intellectual property protection in the Czech Republic. In 2014 the number of patents validated in the CR in 9,6 times more than Czech patents which is the evidence of high level of international cooperation and technology interaction within the EU (Table 6).

Patent specialization of the Czech Republic is most pronounced in such spheres as paper, food and pharmaceutical industries, mechanical engineering and equipment. Relatively few patents in shipbuilding, timber and oil refining industries. There are no patents in computerization and office equipment.

5.1.3 Investment opportunities

R&D investments bring internationally competitive knowledge, innovation and technologies, which are among the most important motivators of the social development. The Czech Republic's spending on R&D has increased continually over the past ten years. In 2004, the country became a member of the EU, which spurred an additional increase of support for science and research. In 2013, R&D intensity in the Czech Republic rose to 1.9 %, very close to the EU average of 2%. Both private and public R&D investment contributed to this improvement. Should the recent trend continue, the Czech Republic would reach a total R&D intensity of 2.97 % in 2020, in line with the overall EU target of 3% (Figure 7).

Figure 7 – R&D investment 2009-2014 in % of GDP



Source: Eurostat, R&D investment, 2014

The Czech Republic has gained access to a variety of European funds and programmes, such as EU Structural and Cohesion Funds. There are there main investment funds can be used particularly for development of R&D infrastructure and companies' innovation activities. In the Czech Republic there are 3 major investment funds for support R&D activity:

- Ministry of Industry and Trade
- CzechInvest
- Association of Foreign Ivestors

In 2015 the **Ministry of Industry and Trade** managed to bring to the Czech Republic a total of 196 investment projects worth a total of 108 billion crowns. Also it supports business sector within the framework of "Operational programme enterprises and innovations for competitiveness", "Competitiveness and innovation programme", "Support for enterprise zones and technology centres" and "Support for R&D" (Ministry of Industry and Trade of the Czech Republic, After eighteen months at the head of the Ministry Minister Jan Mládek says: "We have done a job that brings evident results!", 2015).

CzechInvest is a business and investment development agency of the Ministry of Industry and Trade that contributes to the development of business infastructure by means of support from EU structural funds and national budget within three areas: HR and employment, entereprise and innovation, R&D (CzechInvest, Investment and Business Development Agency, 2015). In 2014 the investment of CzechInvest increased by 81% and number of jobs by 59% in comparison to 2013 year (Table 7).

Table 7 - Investment projects mediated by CzechInvest in 2014

Period	Number of projects	Investment (m.CZK)	Number of jobs
2009	49	14, 065	3 957
2010	60	14, 585	7 027
2011	72	31, 716	10 461
2012	81	20, 372	8 271
2013	108	47, 949	10 519
2014	147	86, 956	16 733

Source: Annual report CzechInvest, 2014

The Association for Foreign Investment is a non-governmental non-profit organization focused on support for foreign direct investment, development of the Czech business environment, export of investments and investment services, and cooperation between companies and the research sphere. The AFI closely cooperates with the national investment and business development agency CzechInvest, the Ministry of Industry and Trade and various other public and private institutions (The Association for Foreign Investment, 2015).

As a whole, the Czech Republic has a strong system of private and public R&D investment. The most essential industries for investment are automotive industry, фармацевтика aerospace industry, mechanical engineering, electrical engineering and electronics, IT, software development, nanotechnology and clean technologies. For 11-years history the investment cooperation of the Czech Republic invested in 366 industrial zones and land plots, 307 industrial parks, complexes and production facilities, 169 office facilities and 16 R&D facilities (Annual report CzechInvest, 2014).

5.2 Estimation of technology transfer system

5.2.1 Overview of technology transfer system

Within the frameworks of innovation strategy of the Czech Republic special attention is given to support for SMEs. Thereupon the institution of scientific and technical parks, business incubators and TTs has proven themselves as reliable partners in innovation field. Main aims and objectives of such structures are development of entrepreneurial activity, creation of privately owned enterprises, transfer of technology into production, intellectual property commercialization, regional development, problem solving with unemployment. Incubators and innovation centers support of innovators including development of business plan, technological consultation, seeking new funding, marketing, legal consultation, protection of intellectual property, vocational training and stuff retraining.

There are more than 50 scientific and technological transfer centers in the Czech Republic. The most significant participant in this field – **cooperation (alliance) of 19 commercial companies and government organizations** which is mandated to support the innovation companies and develop the innovative infrastructure of the Czech Republic:

1. **The Technology Agency of the Czech Republic** provides state support of R&D that has been fragmented and implemented by many bodies before the reform;

2. **Ministry of Foreign Affairs of the Czech Republic** formulates the principles and strategies of Czech development policy;

3. **Czech Innovation (CIN)** creates a community of innovators and ecosystem of partners to support the new ideas and talented innovators;

4. **The Czech Academy of Sciences** conducts basic research in a broad spectrum of the natural, technical and social sciences and the humanities;

5. **Czech chamber of commerce** creates opportunities for business, push through and support measures aiming at further development of business in the Czech Republic and at strengthening the economic stability of the country;

6. **Ministry of industry and trade** implements a government policy and legal regulation in the industrial and defence sectors, supporting industrial exports, ensuring the market availability of goods and services;

7. **Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic** develops cooperation with the government, individual ministries and the sphere of SMEs, help to create the business environment in the country;

8. **Electronic Association of the Czech Republic** coordinates steps of domestic enterprises to ensure joint interests, helps skilled manufacturers succeed and to improve the competitiveness of Czech firms;

9. **Export Guarantee and Insurance Corporation** provides insurance of political and commercial risks related to financing export of goods, services and investments from the Czech Republic;

10. **Czech Export Bank** supports Czech exports and the renown of the Czech Republic as a well-established international exporter, and thus promotes the overall competitiveness of Czech products throughout the world;

11. **Czech Invest** supports existing and new entrepreneurs and foreign investors in the Czech Republic;

12. **Confederation of Industry of the Czech Republic** promotes the conditions in which businesses of all sizes and sectors in the Czech Republic can flourish and stay competitive;

13. **Industrial property office** performs a function of a patent and trademark office;

14. **Association of research organization (AVO)** promote the Czech applied R&D and innovations on both national and international level;

15. **Association of Aerospace Manufacturers of the Czech Republic** acts as a representative of aircraft industry in Czech Republic, Europe and the whole world, promote the Czech aerospace industry and its products;

16. **Association of Accredited and Authorized Organizations (AAAO)** provides services in the field of conformity assessment (testing, inspection and certification);

17. **Chamber for Economic Relations with CIS** promotes Czech businesses in their business activities in the markets of the countries of interest. Emphasized in particular at promoting exports to these territories. Continues concluding a series of cooperation agreement with partner chambers of commerce and industry;

18. **The Association of Chemical Industry of the Czech Republic (SCHP ČR)** is a voluntary federation of manufacturing, commercial, design, research and advisory organisations has relations to chemical, pharmaceutical, petrochemical, and rubber and plastics industries;

19. **South Moravian Innovation Centre** supports cooperation between companies, researchers and universities to the maximum, build a strong entrepreneurial ecosystem.

The one of the most significant transfers is **Technology center of the academy of sciences** that supports the participation of the Czech Republic in the European Research Area, prepares analytical and conceptual studies for R&D, performs international TT and supports the creation and development of innovation business. The technology center has powerful support in the capacity of the Ministry of Education, Youth and Sports (MEYS), Ministry of Industry and Trade (MIT), the Research, Development and Innovation Council (RVVI) and also a number of supranational institutions - the European Commission, the United Nations Industrial Development Organization (UNIDO) and the Joint Research Centre of the European Commission (JRC) (Technology center ASCR, 2016).

Prague innovation center is platform where people, ideas, projects and companies

meet to innovate and grow. Center offers a full range of services:

- rental space in an innovative ecosystem;
- commercialization;
- expertise, consulting, mentoring and coaching;
- technology, patents and products;
- finding for innovative projects.

The Prague development center is a governmental organization that offers 3,000 sqm of highly interactive innovative environment for SME'S and corporates, start –ups or spin-offs, investors and scientists (**Prague innovation center, 2016)**.

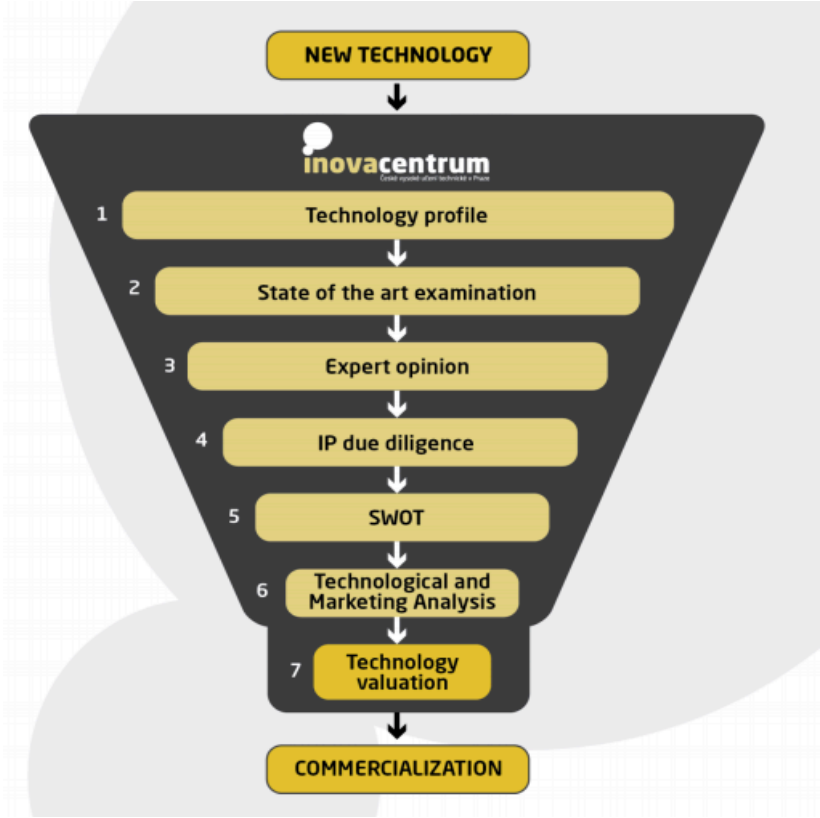
In the Czech Republic there are traditionally successful fields of Czech science and research: medicinal and pharmaceutical chemistry, pharmacology and pharmacochemistry. In this area **Center for Development of Original Drugs** (CDOD) successfully operates in cooperation with TT The IOCB TTO s.r.o. of Institute of Organic Chemistry and Biochemistry AS CR, v.v.i. that supports management and decision making processes (The **Institute of Organic Chemistry and Biochemistry** technology transfer office s.r.o., 2016) and **MSD IT Global Innovation Center** is an innovative, global healthcare leader committed to improving health and well- being by developing and applying advanced capabilities in information sciences, information security, mobility, social media and big data (MSD IT Global Innovation Center, 2016).

In the Czech Republic every institute of higher education has own TT or development innovation center that create indissoluble connection between science and business. **The Centre for Innovation and Technology Transfer (CITT) in Czech University of Life Sciences (CULS)** establishes cooperation between the university and the industry, taking advantage of the research and technology potential of the university for innovation and development in the industrial sphere. Also CITT developed a comprehensive database of scientific research projects carried out at CULS (Czech University of Life Sciences Prague, **Centre for Innovation and Technology Transfer**, 2015)

«Innovacentrum» in Czech Technical University supports start-up companies, educates students and scientists in the fields of TT, intellectual property protection and project management and also provides opportunities for companies to cooperate with top researchers (Czech Technical University, Innovacentrum, 2015). IP is very important for

«Innovacentrum» that pays a lot of attention to intellectual property evaluation process that quarantee high level of successful implementation of innovation (Figure 8)

Figure 8 – IP evaluation process in Innovacentrum.



Source: Property of Innovacentrum

Also technology center «Innovacentrum» proposes the favourable conditions for inventor that is a powerful motivator for R&D activity. The first 1 million CZK goes ti inventor (after the IP protection cost deduction). If the net income is less than 1 million CZK, the inventor obtains at least 50%. The rest is distributed via internal agreement between university departments to their level of contribution.

The Centre for Knowledge and Technology Transfer (CPPT) in Charles University provides information and support services for knowledge and technology transfer (KTT). The Centre creates opportunities and an environment to promote knowledge and TT with the goal of increasing competitiveness and attractiveness of Charles University to students, staff, and the public, and to strengthen the "third role" of Charles University. CPPT builds a Charles University Innovation Network by connecting academics across all faculties and parts of C. U. The Innovation Network is based on

cooperation with innovative organizations outside C. U. brokering knowledge, experience, services, information and funding. The Innovation Network is gateway, guide and a mediator between potential partners and the C. U. community (Charles University, Transfer of Knowledge and Technology, 2012).

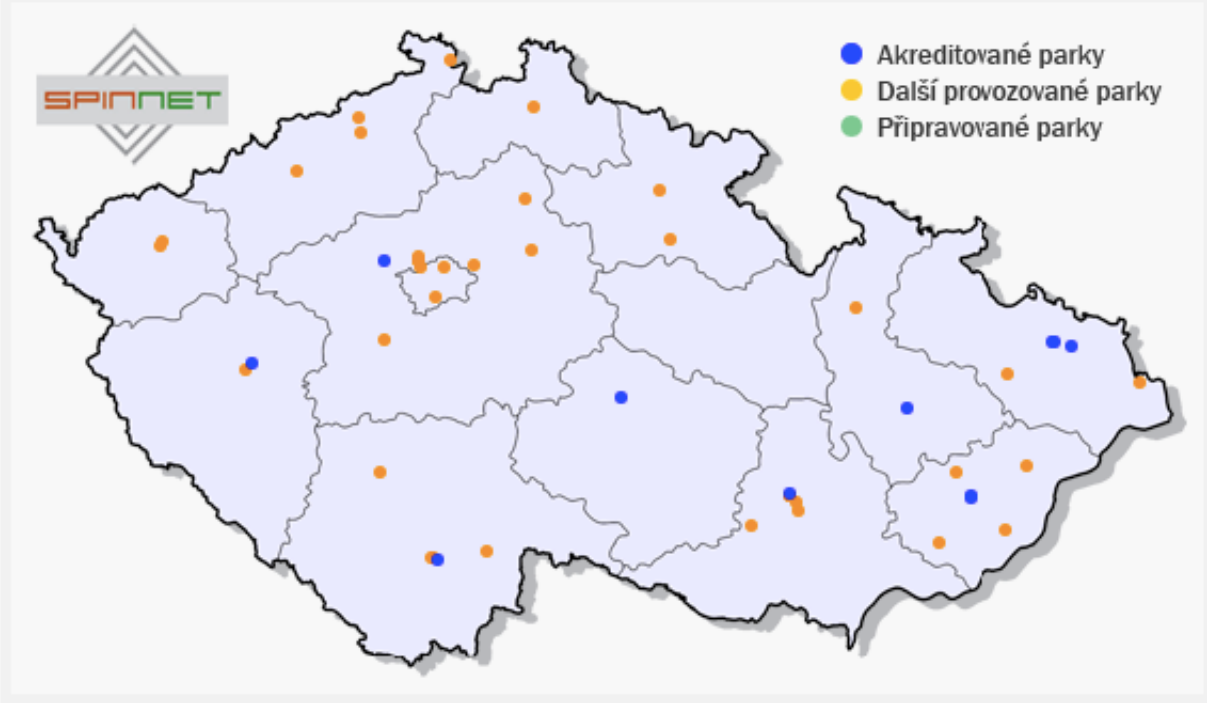
In the Czech Republic Brno is an innovation technology cluster. There are four TT offices: **Technology Transfer Office in Brno University of Technology, Technology Transfer Office of Masaryk University (TTO), Center of Technology transfer in Mendel University in Brno and South Moravian Innovation Centre.** Considerable accumulation of technological centers on a small territory generates highly innovative infrastructure including the protection of intellectual property, finding a commercial application for R&D results and negotiating fair and reasonable terms of company related collaboration.

In the Czech Republic has a strong academic background and every industrial branch is being provided with a set of R&D centers that exerts a positive effect on whole country's economy. For example, in energy industry there are eight centers providing natural-sciences study programmers, including energy technologies: **Energy Research Centre, Centre for Research and Utilization of Renewable Energy (CVVOZE), University Centre for Energy Efficient Buildings (UCEEB), Regional Innovation Centre for Electrical Engineering, Nupharo Park, Hydraulic Laboratory, Alternative Drive Units and Fuels Laboratory and Centre of Intelligent Power Engineering.**

Besides practical support for innovation organization there are sets of educational organizations that connect the world of university primary research with the world of the top companies in the field of technological innovations. **The Centre for Research, Development and Innovation (The CVVI)** and **Prague Development Center (PRADEC)** provide access to results of university research that could be than commercially applied, and in addition the opportunity for closer cooperation with universities, colleges, and research facilities for SMEs (The Centre for Research, Development and Innovation, 2016), (Prague Development Center, 2016).

In the Czech Republic there is a strong network of technology parks and business incubators. There are 48 technology parks on the territory of the country: **11 accredited parks and 37 operated parks** (Figure 9).

Figure 9 - Technology parks in the Czech Republic



Source: Science and technology parks association CR, 2016

Business incubators form supporting platform for the establishment and development of innovative businesses, particularly small and medium-sized enterprises. Business incubators are also important factors in the development of the business environment – innovation cooperation among universities, research institutes and independent enterprises. There is **cooperation of 11 business incubators** in the Czech Republic:

- VUT Technology Incubator;
- CZU University Point One;
- Business Incubator of the Palacký University Science and Technology Park in Olomouc;
- BIC Ostrava;
- Zlín Technology and Innovation Centre;
- Nové Hrady Academic and University Centre;
- Třeboň Innovation Centre;
- Ostrava Science and Technology Park;
- BIC Plzeň;

- North Bohemia Business and Innovation Centre;

- ČVUT Technology and Innovation Centre.

Significant responsibilities are placed on the non-governmental organization **Association of the Innovative Entrepreneurship CR** that combines Science and Technology Parks Association CR, Support of technology transfers association and others. The partners of Association of the Innovative Entrepreneurship CR are leading companies, banks and goverment agencies: CzechTrade, CzechInvest, Economic Chamber of the Czech Republic, Industry and Transport Union of the Czech Republic, Ministry of Foreign Affairs of the Czech Republic and Czech Banking Association.

5.2.2 SWOT – analysis of Czech technology transfer's system

Internal strengths

- Developed cooperation of goverment and commercial organizations to support TT proces;

- High level of cooperation with European and another countries in TT expansion;

- TT process works as single network;

- Access to investment financing TT and start-ups;

- Balanced national budget with funds availible for TT and innovative companies;

- High level of patent activity;

- Availiability of a single base of innovative technologies with detailed information;

- Developed conditions for highly-qualified scientists and researches;

- Expansion into new market through TT;

- High ratio of granted patents in number of patent applications.

Internal weakness

- Low level of commerce applicable innovations;

- Deficit of indirect support measures of TT;

- Low motivation of goverment and research particiations to pay attention to commercialized innovaions;

- Inconsistency education system to market requirements, low mobility and adaptability of graduates;

- Insuficient use of venture capital;

- Cluster development (Brno) which cause unbalanced expansion innovation in the country;

- Undeveloped IP evaluation mechanisms;

- Low participatipation of business-angels in TT process.

External opportunities

- Membership in the EU and ability to achieve the objectives being undertaken in the framework of Lisbor Summit;

- High current economic growth create generally favorable conditions for TT development;

- Strategic policy development in the field of technological development;

- Growing number of federal and regional ministers and agencies engaged in formulation of importance of TT development and expansion;

- High effectiveness of goverment management of R&D;

- Strong cooperation with EU countries in the field of TT expansion;

- Growing competition in European market stimulates Czech innovations;

- Close cooperation between business sector and R&D;

- High demand of innovative technologies in domestic and international market;

- Developing a global market of innovative goods, services and technologies.

External threats

- High competition in internal technological market;

- Complicated legislation, low effectiveness of law enforcement;

- High level of tax assesment of TT;

- High level of monopoly of big companies in domestic market;

- Dominnace of bureaucracy, insuficient bankrupcy legislation, inadequate protection of creditor rights, corruption;

- Increaing level of goverment debt;

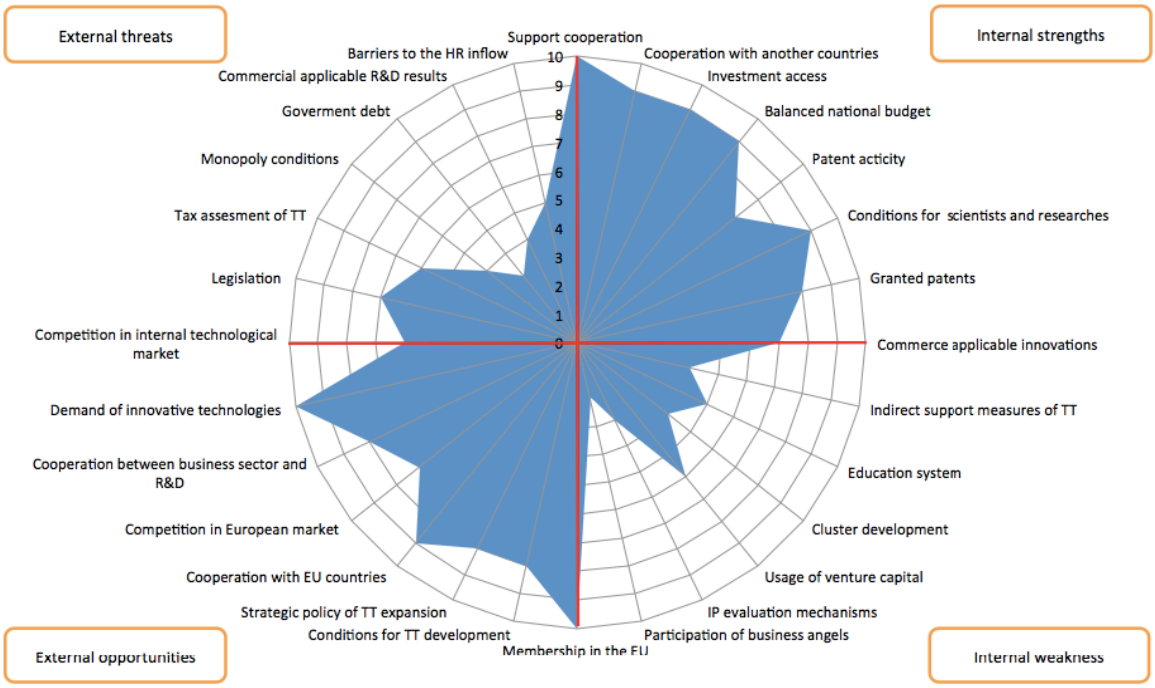
- The predominance of innovations purchased from European and other countries;

- Low level of commercial applicable R&D results;

- The presence of legal barriers to the inflow of highly skilled experts in the country

- Low motivation of public research sector to give priority to commercialized R&D.

Figure 10 – SWOT – chart of Czech technology transfer's system



Based on SWOT – analysis (Figure 10) it's necessary to indicate the high level of internal strengths (average score - 8,71) and external opportunities (average score – 8,57) that positively affect the whole system of TT. Primary such high position of Czech transfers due to high level of state participation, close cooperation business and research sectors, high integration of technology transfer's objects in the innovative infrastructure of the country. Internal weakness (average score – 4,43) and external threats (average score - 5) such as undeveloped legislation in innovative sphere, unbalanced education system for the preparation of specialists for work in the field of technology transfer etc. are not significant factors influencing the TT process in the Czech Republic. Such disadvantages should be eliminated by strong management mechanism of the government authorities, close cooperation in the field of TT and coordination of European Cluster Alliance[3].

[3] The European Cluster Alliance is an open platform established to maintain a permanent policy dialogue at EU level among national and regional public authorities responsible for developing cluster policies and managing or funding cluster programmes in their countries or regions.

6 Analysis and evaluation of innovation generation of technology transfer in the Russian Federation

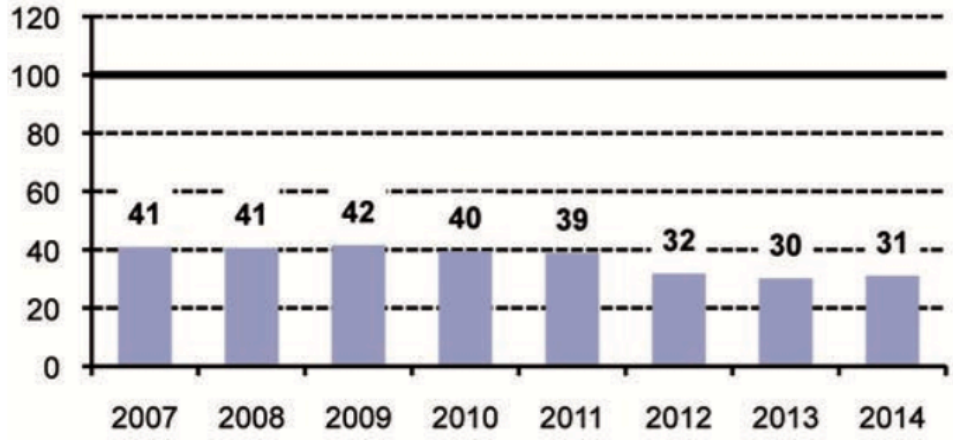
6.1 Investigation of Innovation National System

6.1.1 Innovation infrastructure

Nowadays, creation of innovation infrastructure in the Russian Federation is a key objective for increasing competitiveness of national economy. There is very volatile situation in the field of innovational activity in the country. In 2012 year Russia took 51st place, in 2013 – 62nd position and next year – 49th place among 143 countries (Global Innovation Index, 2014).

Russia's innovation performance is lagging behind that of the EU and the innovation gap continues to widen. Relative innovation performance was above 40% up until 2010 and has decreased to 31% in 2014 (Figure 11).

Figure 11 - Innovation performance of the Russian Federation 2007-2014



Source: Innovation Union Scoreboard 2015

The same situation is demonstrated in innovation activity of Russian enterprises. Small companies of manufacturing sector less adapt at the innovation business than large - and medium - size enterprises due to presence of relatively difficult conditions to start a new business within a country. According to statistics, Russia holds 51st position in ease of doing business ranking among 189 different countries (Doing business, 2015). For 4 years the level of innovations activity of Russian companies has changed by 1%, from 9,5% to 9,9%. The most negative experience dealing with technological innovations get

such parts of economy as communication, computer engineering, information technology, electricity and gas industry (Table 8).

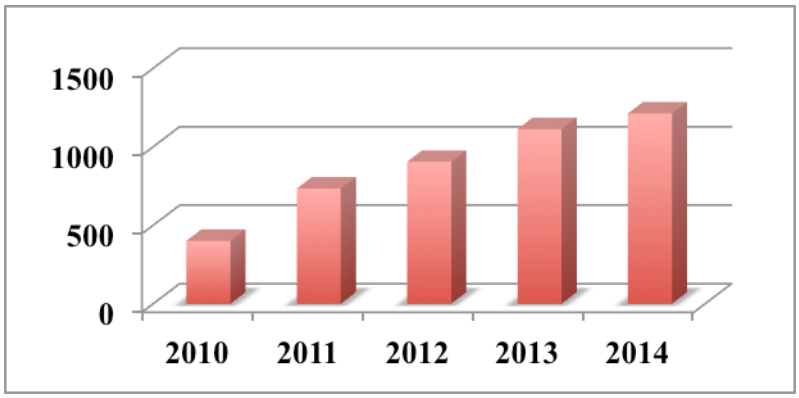
Table 8 - Innovative activity of organizations (unit weight of companies maintaining innovations) by kind of activity in %

Kind of activity:	2010	2011	2012	2013	2014
Total	**9,5**	**10,4**	**10,3**	**10,1**	**9,9**
Mining operations	7,8	8,4	8,2	7,6	7,5
Manufacturing activity	13,0	13,3	13,4	13,3	13,6
Production and distribution of electricity, gas and water	5,4	5,6	5,6	5,3	5,1
Communication	15,6	13,8	13,3	14,2	12,2
Computer engineering and information processing technology	10,0	9,2	9,4	9,6	8,8
The scientific research and development	-	29,8	30,1	31,0	33,3
Other services	4,9	4,9	4,0	3,5	3,5

Source: Federal State Statistic Service, Innovative activity of organizations, 2015

The Russian Federation deminstrates an Asiatic model of innovation policy aimed at accelerated development of innovation ecosystem by mean of huge volume of financing. Practically considerable proportion of R&D costs (40%) (National report about innovations in Russia, 2015) are expenditures for development of military-industrial sector including full-scale production of developed output (Figure 12).

Figure 12 - Total government expenditures for innovation activity for 2010-2012 in million RUB



Source: Federal State Statistic Service, Total government expenditures for innovation activity, 2014.

For the past 15 years in Russia the main problem in the field of human resources is brain drain due to low remuneration of labor, unsatisfactory material and technical base, absence of intellectual property rights, scientific success abroad etc. In 2010 33774 people departed from the country, in 2013 this number increased in 5, 5 times to 186382 people. This process involves increasing significant of well-qualified labor because of countries develop in social and economic directions (Table 9).

Table 9 - Human resources in science and technology in persons

	2010	2011	2012	2013	2014
Total	**736540**	**735273**	**726318**	**727029**	**732274**
Scientific researches, total:	105114	109493	109330	108248	109598
Doctor of Science	26789	27675	27784	27485	27969
Candidate of science	78325	81818	81546	80763	81629

Source: Federal State Statistic Service, Human resources in science and technology, 2014).

The Russian Federation is on 170 place of the international trade across borders among 189 countries (Doing business, 2015). Position of Russian innovations is characterized by export of innovation products and services. In 2014 the share of innovation products in the export structure of goods and services has decreased due to

different trade restrictions. It decreased from 14, 1% to 11, 9% of the total export of the Russian Federation (Federal State Statistic Service, External trade, 2014)

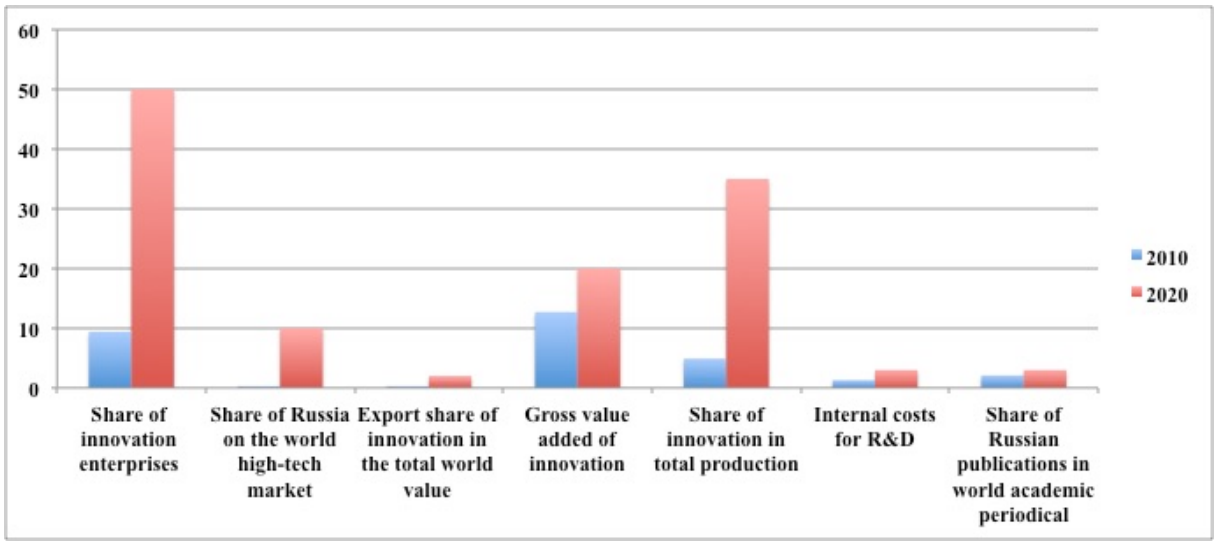
Over the last decade, Russia was an active participant of creation innovation infrastructure within a country. However, adopted measures were not systemic and sequential and finally there are separate components of commercialization process. Stages of innovation cycle didn't get necessary financial, informational and infrastructure support and besides development of links between major players of commercialization is stimulating insufficiently.

6.1.2 Legislative and support framework

At present, existing problems of the technology and income gap between the Russian Federation and developed countries are linked not only with lack of financing, highly qualified personnel and enhanced innovation infrastructure but also with imperfection of the legislative base regulating innovative relationships, which is a loose coupling between development, utilization and commercial realization of high-end technologies.

Development and updating of the legislation in the area of innovative activity is one if the preferred direction is considered in the **Strategy for innovative development of the Russian Federation for the period until the year 2020** (Strategy for innovative development of the Russian Federation for the period until the year 2020, 2014). The concept of main document of innovation development in the Russian Federation was developed on the basis of Concept of long-term social and economic development until 2020 ("Strategy 2020") in accordance with federal law "On science and government technical-scientific policy". The main aim of the strategy is to encourage innovation-based development of the Russian economy by 2020 year. Also strategy emphasis on the evolution of human capital, particularly developing of competitive research, scholastic, administrative personnel and creation of relevant auspicious conditions, increasing level of innovation activity by means of modernization of manufacturing methods and new product introduction into the market and advancing the innovation in the state sector. According to strategy, the Russian Federation should improve the main indices of innovation activity for a 10-year period. The main changes are shown in Figure 13.

Figure 13 - Strategy for innovative development of the Russian Federation for the period until the year 2020



Source: Innovative Russia – 2020, 2015

In Russia an innovation activity is a new concept. Up to the present moment there has been no interpretation of innovation activity in legislative consolidation. Existing legislation doesn't solve key problems related with formation of a common terminology, identification of main direction in the terms of government support and regulation of social relations between participants in this field.

Russian President handles common issues of innovative policy. Such legislative authorities as **The State Duma** and **The Federation Council** have the right to laws formulation in the field of innovation activity. **Federal agency for science and innovation** is central government executive body provides generating and practical realization of state innovative policy and implementing measures on creating and developing of innovative potential (Government policy in innovative activity, 2013).

At present time there are **3 state support institutions of innovation business undertakings** were developed by government:

1. Government corporation **«Russian Corporation of Nanotechnologies»** implements state policy for the development of the nano-industry in Russia;
2. **Development fund of support for small enterprises in scientific and technical sphere** – government non-profit organization provide information, financial assistance;

3. **«Skolkovo»** provides the formation of complete cycle of innovative process inclusive technical advisory services, R&D, financing and commercialization.

At present time, regional legislation in innovation activity demonstrates the wide variety in dealing with forms of government support of innovative activity that is in the development stage. As a result of it, there is a big difference between levels of innovation development of different regions. For example, in Volga Federal District there are 122 participants of innovative process when at the same time only there are 6 participants in Dalny Vostok Federal District (Innovative Russia – 2020, Innovative territorial clusters, 2015). Such existing administrative and legal problems as the concept of state support of innovative business undertakings, identification of most important forms, classification, limited access to support, administrative barriers are decreasing effectiveness of government support in the field of innovations.

6.1.3 Patent activity

Patent activity is one of the important indicators of R&D effectiveness. According to World Intellectual Property Indicators in 2014 Russia took 7th place in ranking of patent activity among 100 countries. Taking into account well enough position in the ranking, It should be noted the huge difference between the amount of patent applications shown in Table 10.

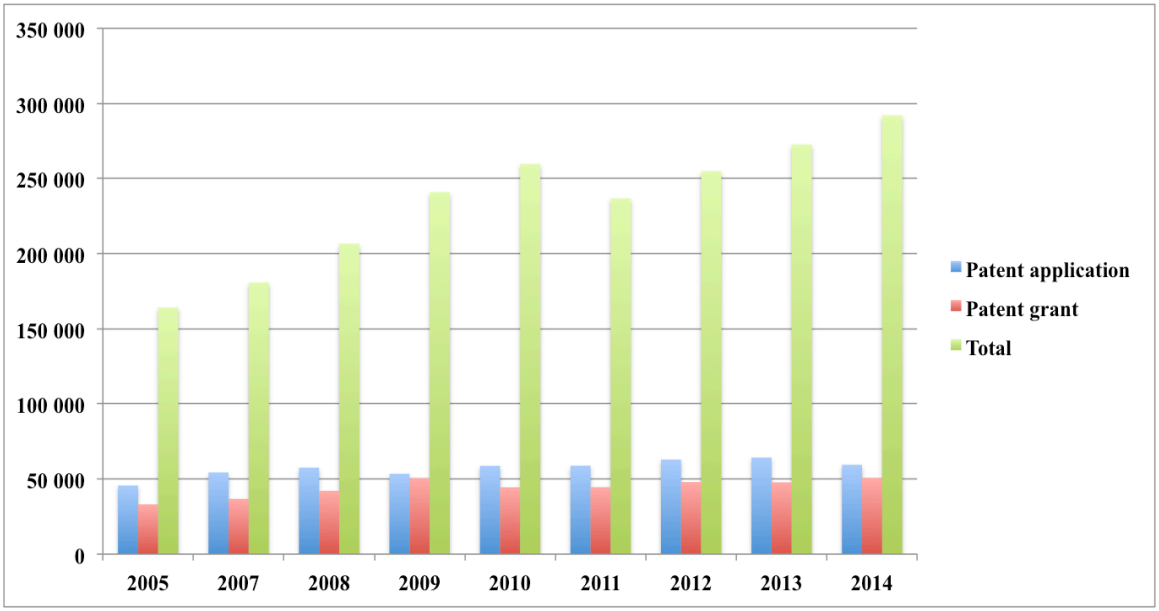
Table 10 - Ranking of resident IP filing activity by origin, 2014

Country	Patents	Marks	Designs	Patent applications
China	1	1	1	704 936
United States of America	2	2	9	287 831
Japan	3	7	6	271 731
Republic of Korea	4	9	3	159 978
Germany	5	4	2	47 353
France	6	3	8	14 690
The Russian Federation	7	8	20	28 765

Source: World Intellectual Property Indicators, 2014

As a whole, Russia has positive changes in the patent statistic. For 9 years the number of patents expanded 53% from 33101 to 50772 patents and grand applications grew by 30% from 45644 to 59444 applications (Figure 14). Also it can be noticed high level of patent confirmation (on average 70% for the period of 9 years) due to the high quality of introduced innovations.

Figure 14 - Patent statistics for 2005-2014 in Russia



Source: Federal State Statistic Service, Claims for patents and issue of security documents in Russian, 2014

For a present day, Russian authorities have already taken steps to establish an effective patent system. «**Development Strategy of Rospatent till 2020**» was approved by the Government of the Russian Federation (Annual report of Rospatent, 2012). This strategy allows creating the innovative patent authority that is mandated to solve such problems as time abridgement of examining patent applications, increasing quality of expertise, improving cooperation with the World Intellectual Property Organization etc.

6.1.4 Investment opportunities

Prerequisite for sustainable development of economy and creation of NIS in Russia is high investment activity. Also attracting foreign capital in the form of direct, portfolio investments and other financial assets play important role. Main financing sources of innovation activity are budget and extra budgetary funds. Financing at the budget funds is

performed in accordance with innovative policy of the government. Subjects of innovative activity engage extra budgetary funds. In many countries government and private investors perform financing at the same time. In the Russian Federation in most cases the main investor is the government of the country (Table 11).

Table 11 - Total goverment investment and investment for R&D activity in billion RUB

	2007	2008	2009	2010	2011	2012	2013	2014
Total investments	5281	6794	6117	6712	8581	9768	10195	11071
Investments for R&D activity	15,7	21,8	20,5	26,8	33,5	53,3	63,3	71,4

Source: Federal State Statistic Service, Investments in Russia, 2015

As we can see, in 2014 only 0, 6% of total investment is for innovation development. According to estimation of National association of innovation and development of IT, required sum for effective development of innovative infrastructure is RUB 616 billion – 8, 6 times more than extended investments (Innovative Russia, 2015).

In spite of government investments there are business angels and venture capital funds working with innovative companies and project. The total capital of ventures funds is $26,8 billion. For 3 last years the number of ventures funds grew by 11% (from 322 in 2013 to 360 in 2015) and total venture capital decreased by 5,9% (from 28430 in 2013 to 26776 in 2015) (Preqin Global Private Equity & Venture Capital Report, 2015).

In Russia private investment of business angels in 10 times less than in the EU and in 70 times less than in the United States (BBC, Business angels: to risk everything to get a billion, 2013). There are several **networks of business angels** that provide financial and expert support for companies in the early phases of development.

1. The National Union of business angels;
2. National association of business angels;
3. National network of business angels **"**Private capital";
4. Association of business angels "Start investment".

For Russia term «business angel» is relatively new and market size of angel's investments is small. The main purposes of business angels are being accomplished by grant programme and government development institutions such as Russian Venture

Company and Internet Initiatives Development Fund prepare and train new investors.

The most significant and authoritative venture fund is **Russian Venture Company** created for implementation of the National Technology Initiative (NTI) - the long-term strategy of the country's technological development, aimed at formation of new global markets by 2035. Under the direction of RVC there were created four funds:

1. **Seed Fund** is focused on investing into Russian innovative companies with high growth potential on Russian and foreign technology markets.

2. **Civil Technology of MIC** is a targeted fund created as an investment tool facilitating access to the Russian and international markets for MIC technologies and projects.

3. **Biofund** is focused on investments in innovative biopharmaceutical and service companies providing contract laboratory, information and analytical, and consulting services to companies in the biotechnological, pharmaceutical, and medical industries.

4. **InfraFund RVC** addresses investment applications made by such entities as companies performing services for Innovation Companies and involved in consulting, expert review, research, analysis, science and development (Russian Venture Company, 2016).

Internet Initiatives Development Fund is a Russian venture capital fund established by the Agency for Strategic Initiatives. The Foundation invests in technology companies in the early stages of development, develops a network of start-up accelerators, and is involved in the development of methods of legal regulation of the venture industry (Internet Initiatives Development Fund, 2016)

Unfortunately, existing legislation regulating investment activities cannot ensure growth of effectiveness. The opportunities of regional governments in increasing of investment appeal of territories are limited by budget. For the construction of national innovative system it’s necessary to adopt radical measures relating to development of effective financing mechanisms on the basis of motivate, support stimulating approaches of innovational activity. Creation of such mechanisms allows developing interest of potential investors leading to positive changes in the field of risk investments.

6.2 Estimation of technology transfer's system

6.2.1 Overview of technology transfer's system

Analysis of international transfer of results of scientific and technical activities can be used to identify the positioning of the country in the high- tech market and trade efficiency of technologies with foreign partners. In 2013 total import payments ($2,4 billion) were 3, 2 times the size of total export payments ($0,7 billion) making deficit equal to $1,7 billion that was by 200 percent more than the parameter of 2005 (Federal State Statistic Services, External trade, 2014)

Russia has the biggest territorial resources that play an important role in formation of effective economy and need in rational utilization. As for today, there are several types of technology transfer on the country's territory:

1. TT centres;
2. Business incubators;
3. Technoparks;
4. Scientific cities;
5. Closed administrative- territorial units;
6. Technological and innovation zones;
7. Science campuses (Science sities of modern Russia, 2014)

Scientific cities. Municipal units should meet definite such criteria as scientific and production activity must be city-forming, the number of scientific workers should be not less than 15%, results of research-and-production activity must exceed 50% from total product release. Today, in Russia there are 75 scientific cities, but only 14 municipal units have official status according to the decree of the Government of the Russian Federation (Science cities of the Russian Federation. New status of science cities in XXI centuty, 2014). These municipal units have high level of industrial and technological base and favourable conditions for scientists, as the result, there is low outflow of specialists. Financing is provided by Federal budget and doesn't differ by predictability. Science cities still don't achieve sufficiently high level of development and need government financing support so far. Government in turn decreases the financing resources (in 2011 - rub 576 million (City development: innovations plus city's potential, 2014).

TT centers. Several mechanisms have been set up in recent years to transition technology into targeted applications; these include Technical Promotion Zones, State Corporations that specialize in transitioning defense and national-security centric technology, and the Russian Technology Transfer Network is an association of over 50 Russian innovation centers from more than 40 regions of Russia and the CIS (Russian Technology Transfer Network, 2016).

Business incubators. Business incubators in Russia are evolving from supporting small businesses to supporting fast-growing breakthrough start-up companies. Russia averages one business incubator for every 2.7 million people compared to the United States which has one incubator for every 280,000 people.

The most recent wave of Russian start-ups (such as Kaspersky Lab, Ozon, Mail.ru) has attracted attention from incubators and accelerators from the Baltic and Nordic region. For example, Finland's 2011 Startup program admitted three Russian companies. One of them is Maxygen, a young company producing inexpensive DNA tests to detect infectious diseases in 15 minutes compared to the industry average of 2–3 hours (Startup Community in Russia and Ukraine, 2013).

Technoparks. The locations of Russia's technoparks are planned so as to concentrate resources in areas where there is a proven technical expertise with the hope of creating local spillovers. Table 12 lists the number of technoparks, business incubators and TT centers in Russia today. Technoparks have been created in Zelenograd, Skolkovo, Dubna, Tomsk, Innopolis, among other places. While there have been mixed results thus far, the potential of these technology parks has been hindered by mismanagement and an inability to attract foreign investment

Table 12 - Technoparks, incubators and TT centers

Type of organization	Number	Per 100 000 researches
Technoparks	83 (up to 55 in 2013)	21,3
Business incubators	89 (up to 75 in 2013)	22,9
Technology transfers centers	100 (up to 86 in 2013)	25,7

Source: Innovative Russia – 2020

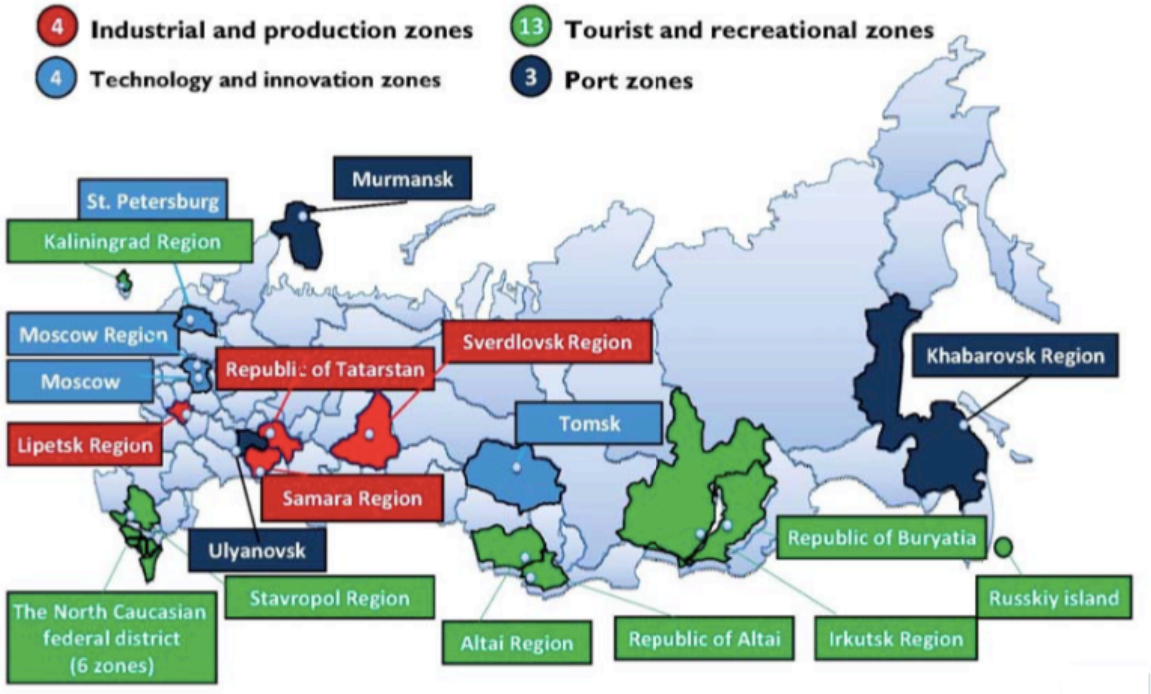
Also it can be distinguished such instruments of innovative development as closed **administrative - territorial unit** and science campuses. CATU are defined urban

districts that contain strategically important enterprises than had been suspected closure of information. The territory of the CATU is the place where there are different creations and scientific development. But the investigation results are not widely used in economical activity of the country.

By **science campus** are understood districts in some cities in Russia (the most well-known are Novosibirsk, Tomsk, Irkutsk and Krasnoyarsk). The main disadvantage is obsolescence of scientific base particularly scientific personnel. This is due to a number of factors, including the unwillingness of oncoming generation to continue scientific activity because of this lack of opportunity for successful job placement provoking «brain grain» into big cities.

Another important instrument of TT and development of innovation technologies in Russia as a whole is **technological and implementation zone.** Special economic zones attract many of the world's leading technology-based companies with special tax privileges, the right to buy land, simplified customs clearing procedures, and cheap access to basic infrastructure (Challenges and solutions: business incubators and technoparks in Russia, 2014).

Figure 15 - Special Economic Zones in Russia



Source: Ministry of Economic Development of the Russian Federation, 2014.

Main distinctive features of the TIZ are presence of specialization, development of not scientific business structure, creation of such special conditions as tax allowance, accordance of custom duties and eliminating of government barriers. Original purpose of TIZ is formation of "core" of territorial-production complex for acceleration of economic development. In spite of top declared level, there are all sorts of problems. First of all, low level of government financing support. Because of this, the project payback becomes a time-consuming process because it's necessary long-term credits with relatively low interest rates. Second, promised preferential tax is inaccessible for every resident of TIZ. Part of the reason for it is that process of receiving preferences becomes long-term and complicated due to lack of development of financial structure.

Nowadays there are not so many examples of successful technology commercialization. Furthermore, practice of TT didn't get proper development in the Russian Federation. The most common explanation is that lack of understanding of the TT mechanisms particularly direct allocation between business and research organization, absence of orders on the part companies and low level of interaction with foreign organizations from research universities to production business. In that way, as of date there are huge amount of barriers occurring between the participant of innovative process – science, production, financing institutions, government and customer. And for effective development of country's economy it's necessary to activate all participants and mechanisms of innovative process.

6.2.1 SWOT – analysis of Russian technology transfer's system

Internal strengths

- Developed TT network within a country;
- Strong position of industrial TTs the field of defense, energy, space and nuclear;
- Qualified (higher than in China) and cheap (cheaper than in Europe) workforce, scientific and technical personnel;
- Increase cooperation between TT and educational research institutions aimed at creating a new generation of innovators, enterpreneurs and managers;
- Developed cooperation of business-angels;
- Development cooperation with foreign TT and business-incubators;

- High ratio of granted patents in the number of patent applications;

- Availiability of a single base of innovative technology (ROSPATENT);

- A high level of consulting services under of TT;

- Expansion into new market through TT.

Internal weakness

- Low level of commercialization of innovative technologies;

- Ineffective management mechanisms of the TT process;

- «Brain drain» of highly educated personnel;

- Insufficient intellectial property rights;

- A huge number of different forms of TT without division of innovative activity;

- Lack of goverment orders for high-tech development;

- Low level of cooperation between objects of innovative technology transfer's infastructure;

- Lack of public and private investments;

- Undeveloped mechanisms of venture capitals and venture funds;

- Absence of policy designed for improvement intersectoral knowledge and TT.

External opportinities

- Strengthening of relations in international technological cooperation;

- Strategic policy documentaion in the field of TT;

- Growing number of federal and regional ministers and agencies engaged in formulation of importance of TT development;

- Regional innovation strategy aimed at more active cooperation between regions in TT and innovative policy implementation;

- Developing a global market for innovative products, services and industries;

- The reduction of oil prices which lead to «innovative development» from «resources curse»;

- Great potential for development of advance science and technology in the field of defence, space and nuclear energy;

- An increasing number of innovative SME in various sectors of the economy and implementation new production and techniques;

- Historically strong scientific and technical culture, traditions and experience in organizing and conducting R&D.

External threats

- Lack of goverment support of TT system;

- Technological gap;

- High level of bureaucracy and corruption;

- Undeveloped legislation system and poor implementstion of policy directed to problems of technology retardation;

- Growing competition in global market of innovative technologies;

- Strengthening protectionism by foreign countries (EU);

- Lack of competition in domestic market;

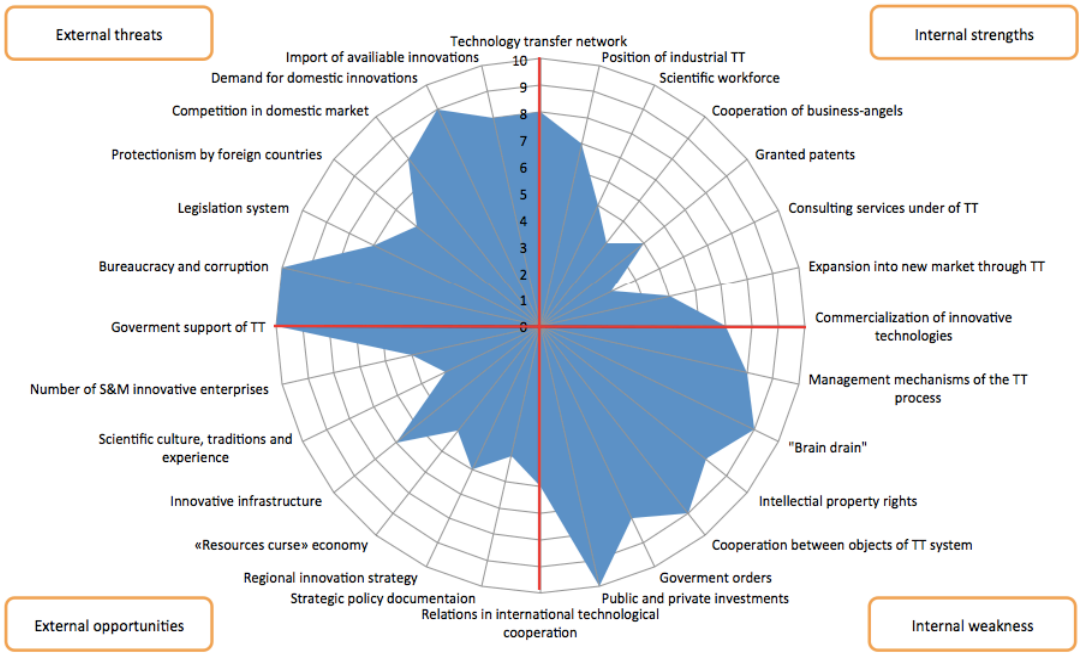
- Low coordination between business sector and R&D;

- Low demand for domestic innovation technologies in local and international markets;

- Dominance of influential resource companies, high level of monopoly;

- Import of availiable innovative technologies prevents the development of own innovative ideas.

Figure 16 – SWOT – chat of Russian technology transfer's system



According to SWOT – chart (Figure 16), it's necessary to indicate the low level of internal strengths (average score - 5, 29) and external opportunities (average score – 5,43). At the modern period of economic development the TT's system is having a tough time. Low level of government support, insufficient number of public and private investment, lack of interest in innovation, undeveloped innovative infrastructure and cooperation between business and science lead to technological gap of the country. Internal weakness (average score – 8, 43) and external threats (average score – 8, 29) display the low development level of intellectual property rights, legislation system, management mechanism of TT etc. In case of Russia, it's necessary to implement development strategy, which would cover all components of TT's system and innovative infrastructure as a whole.

6.3 Comparative analysis of technology transfer's system in the Czech Republic and in the Russian Federation

Based on the conducted analysis of innovative activity both countries, the following results may be concluded:

1. **Innovative performance.** The Czech Republic has a relatively good position (26th place) in the ranking of innovative performance among 143 countries. In turn of Russia - 49th position. This index reflects the development level of innovative institutes, human capital in R&D, knowledge and technology outputs, innovative infrastructure, market sophistication and innovation activity of business in country (Global Innovation Index, 2014).

The Czech Republic is «moderate» innovator and the number of innovation enterprises is increasing from year to year, especially in business sector (increase of 6% from 2011 to 2014) (Innovation Union Scoreboard, 2015). The Russian Federation is «modest» innovator with innovation performance well below that of the Czech average.

2. **Government expenditures**. The one of the main problems in the Russian Federation is a lack of R&D expenditures. According to R&D Expenditure Index created by UNESCO Russia has ranked 32nd place (1,16% of GDP) and the Czech Republic is number 26 (1,56% of GDP). There are proportional growth of R&D expenditures of both

countries (UNESCO, Institut for Statistics, Gross domestic expenditure on R&D, 2014), but in the Russia there is inefficient distribution by reason of high level of bureaucracy and corruption (Im Westen nichts Neues, **2013)**

3. **R&D human resources**. In Russia 2014 year is a year of mass emigration. From January to August the level of emigration was 203 659 highly qualified people (in 2013 year - 186 382 people). According to statistics of Russian Migration Center the most essential professionals abroad are Russian physicists (33,6%) and biologists (22,8%) (Why did the Russian scientists leave the West?, 2015). In 2013 in the Czech Republic the level of emigration is reduced by 2,3 times in comparison with 2009 (from 61782 to 25894 people) (Eurostat, Emigration, 2014) by reason of rapid development of the Czech economy and social setting for local population.

4. **External trade of high-tech.** For a long time Russian economy was focused on the commodity export. Under the conditions of instability of oil prices country is striving to expand share of high-tech export by developing of TT's system. In turn of the Czech Republic developed close collaboration with EU-27 providing well-developed distribution channels in the field of high-tech trade. For the period 2011-2015 the high-technology export of the Czech Republic ($ 20,921,357,479) is approximately 2 times larger than the Russian high-technology export ($8,655,776,675) (The World Bank, High-technology exports, 2014).

5. **Legislation and support framework.** The Czech Republic, as a membership of the EU, is maintained by plenty of strategic framework programmes. Such documents are very important for strategic development of innovative infrastructure. Also Czech government has already developed legislation measures to support innovative activity within a country. Russian legislation system as compared with Czech practice contains insufficient quantity of stimulating measures. The important objectives of Russian government should be developing recommendations on the addition, modification of already existing Russian laws, adoption of new statutes for improvement of innovative conditions.

6. **Patent activity.** The regulating authority of the Russian Federation The Russian Federal Service for Intellectual Property, commonly known as Rospatent. Over a period of Rospatent's activity the level of counterfeit products, ranging from compact discs and

software to clothing, are increasing from year to year. In 2015 the number of counterfeit increased by 3,57 times in comparison to 2014 (from $420 billion to $1500 billion).

In the Czech Republic patent activity is heavily regulated by Industrial Property Office, European Patent Organisation, national laws, EU laws and international treaties. The biggest number of Czech patents were registered by applicant from another countries. This was supported by Convention on the Grant of European Patents that provides an autonomous legal system according to which European patents are granted. According to problems relating to counterfeit products the Czech Republic has approved the following documents: Strategy of protection and enforcement of intellectual property rights in third countries and Multiannual plan 2014 - 2018 of European Observatory on Infringements of Intellectual Property Rights which enhance IPR standards and stem the trade in IPR-infringing goods, thereby ultimately enhancing country's competitiveness, growth and jobs.

7. **Investment opportunities.** The low level of private investments is a conclusive proof of disinterestedness in development of innovative sector in Russia. According to estimation of National association of innovation and development of IT, required sum for effective development of innovative infrastructure is RUB 616 billion – 8,6 times more than extended investments.

The Czech Republic has powerful support of investment funds and agencies which attract private investments for enhancing of R&D activity within country. All funds form an integrated core interacting with the European investment authorities. As a whole, private investments meet the requirement of innovative companies within a country.

8. **Technology transfer's system.** In the Russian Federation the TT's system is defined as a network of independent technology transfer's objects not linked by any unity of plan or of action. By reason of a wide variety of objects there is not a division of labor in innovative sector and consequently a common development strategy of technology transfer's process.

The opposite situation exists in the Czech Republic. The technology transfer's activity in regulated by cooperative including the government and commercial organizations that control and support the innovative activity in the country. As distinct from Russia, there are only 3 types of technology transfer's objects: technology transfer

center, technology parks and business incubator, making it possible to differentiate activity reliably.

9. **Innovative potential.**

Table 13 – Calculation of innovative potential of the Czech Republic and the Russian Federation

Indicator/ Country		The Czech Republic	The Russian Federation
Domestic expenditure on R&D as a percentage of GDP	**X1**	3 515 646 240 USD * 100)/ 85 104 000 000 USD = **4, 131 %**	(23 100 000 000 USD * 100)/ 1 043 170 254 000 USD = **0, 22%**
The share of employment in R&D as a percentage of total employment	**X2**	**37,7%** (Eurostat, Human resources in science and technology, 2014)	((12 565+732 274) *100)/41 094 000= **1,81%**
The share of R&D enterprises in their total number	**X3**	(2840 * 100)/2 733 459 = **0, 1 %**	(3604 * 100)/ 5 600 000 = **0, 06%**
The cost of technological export as a percentage of GDP	**X4**	(19 881 842 * 100)/ 149 906 802 060 USD = **0, 01326%**	(55 670 900 * 100)/ 496 700 000 000 USD = **0, 0112%**
Innovative potential	**R**	0,3*4,131+0,2*37,7%+0,2 *0,1%+0,3*0,01326% = 1,24+7,54+0,02+0,0039 = **8, 804**	0,3*0,22% +0,2*1,81% + 0,2*0,06% + 0,3*0,0112 = 0,066 + 0,362 + 0,012 + 0, 0033= **0, 44**

According to calculation based on methodology of Mark Anderson and Victor Warner, the innovative potential of the Russian Federation is in 20,009 times lower than potential of the Czech Republic. Such a low result of Russia is due to low indices that are included in the assessment of the country's innovation potential.

10. **SWOT – analysis of the technology transfer's system.** According to estimation of strengths/weakness of technology transfer's system and opportunities/threats of innovative infrastructure, following indices have been identified:

Table 14 – Indeces of SWOT – analysis of the Czech Republic and the Russian Federation

Parameter/ Country	The Czech Republic	The Russian Federation
Internal strengths	8,41	5,29
Internal weakness	4,43	8,43
External opportunities	8,57	5,43
External threats	5	8,29
Total assesment	**7, 55**	**- 6**

Thereby, Russian innovative development remained well below the Czech Republic by all indications. In Russia TT centers and business-incubators turn into office for leasing. The availability of venture finds, technology parks, industrial zones and etc. doesn't lead to significantly raise the level of innovative activity. Consequently, innovative development requires substantial additional efforts to establish necessary and sufficient conditions in the country.

7 Development strategy for technology transfer's system in the Russian Federation

7.1 Internal improvement of technology transfer's systém

7.1.1 Basic recommendations

The most important directions of the technology transfer policy can be grouped into the following main large blocks:

1. Improvment the cooperation between the academic and business spheres and improvement of dissemination mechanisms and knowledge transfer;

2. Development of the law "On state regulation of activities in the field of technology transfer" which defines the legal, economic, organizational and financial principles of state regulation of activities in the field of technology transfer and aims to ensure the effective use of scientific, technical and intellectual potential of the Russian Federation;

3. Expansion of a plan for organizing and maintaining the register of new technologies and their components, new types of equipment and materials to facilitate their futher commercialization and use in economic circulation;

4. Development of measures for the integration of the Russian and European TT network;

5. Construction of infrastructure for the external trade of Russian technologies;

6. Streamlining processes incorporating IP into economic circulation in accordance with the international standards;

7. Promotion the establishment and improvement of the Russian economy of the innovation infrastructure. For this purpose, to develop measures of gradual transition of enterprises and their associations to participate in the designated structures;

8. Development of recommendations to support the activities of non-governmental organizations that works in the field of science, technology, innovation and technology transfer;

9. Promotion the establishment of the market and the organization of the transfer of advanced manufacturing technologies, while stressing the fundamentally new technologies as those that have no analogues in Russia or abroad;

10. Promotion the involvement in economic turnover of the rights of intellectual

property and ensuring reliable protection against unauthorized use;

11. Creation of conditions for technological innovation, provide an assessment of the technological level of production, technology monitoring and forecasting process at the macro and micro levels;

12. Development of conditions for implementation of technological innovations, provide an assessment of the technological level of production, technology monitoring and forecasting process at the macro and micro levels;

13. Introduction of the market mechanism of formation and proximity to the consumer scientific and technological proposals for the establishment of the existing demand for the relevant intellectual product;

14. Develop common methodology to all industries and for individual sectors of the economy for the identification and evaluation of know-how, based on a broad study of the practical experience of identifying and evaluating the know-how in various sectors, international and domestic trade licenses know-how;

15. Create a network of venture capital funds to support innovation and the network of foundations promotes small businesses in the field of science and innovation in the regions;

16. Organization of professional training on a regular basis (business trainig, management, systems analysis, information technology, the basics of foreign trade activities, franchising, the principles of sustainable development, and others);

16. Create mechanisms for enhanced exchange of experience and the development of the relationship between the regions in innovation.

In general, the successful implementation of the proposed directions of the transition to an innovation-based economy, knowledge will not only maintain but also to compensate for the level of development of intellectual potential of the country.

7.1.2 Cooperation strategy

As Czech practice shows, dominant form of innovative activity is cooperation of government organizations, educational institutions, investment trusts and commercial companies. Such cooperation supports technology transfer's process, provides increasing complexity of technological base, accelerates of the technological cycles, and increases of the cost of the innovation. In Russian Federation cooperation should perform all functions

in the field of innovative activity and should be represented as follow: transfer funds, transfer media, transfer agents, industrial treansfers and transfer recipients.

Transfer funds focus on the innovative organizations or scientists seeking financial support at the stage of R&D:

1. **Russian Venture Company (RVK)** is a government fund of funds and a development institute of the Russian NIS;
2. **SBT Venture (SberBank Venture Capital)** stimulates the creation of Russia's venture capital industry and the significant increase in the financial resources of venture capital funds;
3. **National association for business angels** is industrial association of ventures investors that combines individual investors (business angels) and institutional investors (venture capital funds) to support innovative business in Russia;
4. **The Russian Agency for Export Credit and Investment Insurance (EXIAR)** is responsible for insurance support for exports of Russian goods and services;
5. **Vnesheconombank** provides continuous financing of innovative projects at all stages of the innovation cycle.

Transfer media are formal and informal transmitter that the innovation is transferred:

1. **Federal Service for Intellectual Property (ROSPATENT)** is an executive authority performing functions of control and supervision in the area of the legal protection and exploitation of intellectual property rights, including patents and trademarks;

Transfer agents are the authority or organizations are supporting new industries and coordination of perspective technological cooperation:

1. **The Technology Agency of the Russian Federation** is responsible for development of state programs to support new industries and coordination of perspective technological projects having cross-sectoral importance;
2. **Russian Academy of Sciences** develops of basic research aimed at obtaining new knowledge about the laws of nature, society, individual and promoting technological, economic, social and spiritual development of Russia;
3. **Foundation for Advanced Studies** implements of R&D in the interests of defense and national security associated with a high degree of risk to achieve qualitatively new results in the military-technical, technological and socio-economic spheres;
4. **Foundation for Assistance to Small Innovative Enterprises in the scientific and technical sphere** is state non-profit organization conducting public policy

development and support for science and technology;

5. **Innovative Entrepreneurship Development Fund** creates a system of open R&D centers on the basis of the territorial chambers of commerce, technology parks and business incubators, which will be combined into a single "scientific and technological" network of innovative companies and developers;

6. **Association of public research centers "SCIENCE"** is non-profit organization that promotes the consolidation of the activities of scientific organizations, which the Russian government granted the status of state research centers. The association includes 43 public research centers located in 7 Russian regions;

7. **The Association of of innovative regions of Russia** ensures conditions for innovative development of the regions through the implementation of effective national and regional policies that promote social and economic development of the Russian Federation;

Industrial transfers are goverment organizations that support technology transfer in the field of critical technologies.

1. **RUSNANO** implements state policy for the development of the nanoindustry in Russia, acting as a co-investor in nanotechnology projects, which have substantial economic or social potential;

2. **The National Association of innovation and development of information technology** is responsible for consolidation of Russia's innovation potential, the organization of interaction between members of the association with the representatives of venture capital funds, funds to assist in the choice of priority projects for the distribution of finances;

3. **The Russian Association for Electronic Communications (RAEC)** formates a civilized market of electronic communications, to support projects in the sectoral education and research, the development of regulatory and legal framework to protect the interests of market participants;

4. **Union of Composites Manufactures** is responsible for strengthening of cooperation communications between producers and consumers, assistance to market promotion of composite materials and articles;

5. **ROSATOM** fulfills state tasks defense capability, nuclear and radiation safety, social acceptability of nuclear power production and the achievement of technological leadership.

6. **Information & Computer Technologies Industry Association (APKIT)** – is the association defends the interests of the IT branch and favours the expansion of the

market. This is a collaborative effort with the government authorities and a mechanism for interaction within the IT;

Demand environment are market and non-market factors pertaining to the need for the transferred object:

1. **Ministry of Foreign Affairs of the Russian Federation** is federal executive authorities of the Russian Federation exercising the state control in the sphere of relations of the Russian Federation with foreign states and international organizations;

2. **Chamber of Commerce and Industry of the Russian Federation** represents the interests of small, medium and large businesses, and covers its all business sectors - industry, domestic and foreign trade, agriculture, financial system services;

3. **Ministry of Industry and Trade of the Russian Federation** regulates foreign trade, defense and civil industries, metrology, technical standardization, and aviation technology development;

4. **The Russian Association of Small and Medium Enterprises** is responsible for the development of SMEs, and establishing favourable conditions for an entrepreneurial culture in Russia.

Transfer recipients are the objects of technology transfer system receiving the transfer object.

1. **Skolkovo** is responsible for formation of a favorable environment for the innovation process: scientists, designers, engineers and businessmen together with the participants of educational projects working on a competitive knowledge-based development;

2. **Russian technology transfer network** is an instrument of national and regional innovation infrastructure that enables information technology to disseminate effectively and to search for partners for innovative projects;

3. **The Center for Strategic Research Foundation** promotes development of promising new markets on the basis of high-tech solutions that will determine development of the global and Russian economy in the next 15-20 years;

4. **International Association of scientific parks** consolidates the efforts of the innovation community, business and public authorities in order to significantly improve the efficiency of infrastructure for the commercialization of R&D of new technologies.

TT shouldn't be directed to sales of technologies. According to Czech practice, the activity of technology transfer must be focused on economic development of territory, promoting sustainable development of scientific and business cooperation, investments

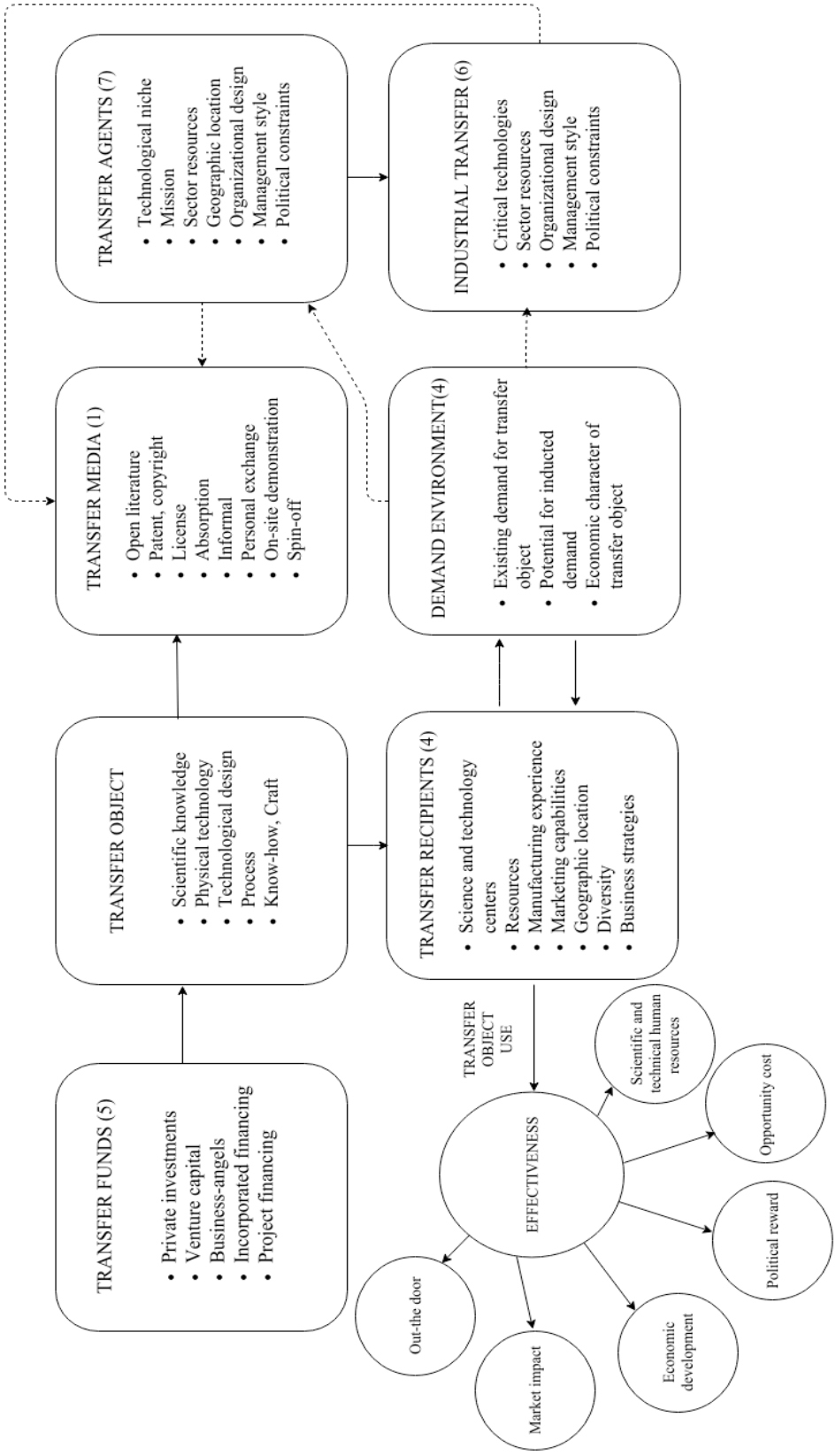
attraction, commercialization of R&D, integration of science, education, producing, governance and consumers. So it is important to combine all participants of technology transfer's infrastructure into a single strategy (Figure 17).

In Russian literature TT is investigated as advancement of individual innovation. According to the Czech experience, TT should be treated as interaction and exchange of information on technology between private business, universities and research laboratories, the result of this interaction serves products made in the application of new technology. Participation of national economic entities in the process of international TT can not only raise the level of competitiveness of the economy, achieve economic growth such as innovation, but also to reduce the technology gap between countries.

Figure 17 shows the interaction of the complete (multi-stage) transfer participants. Transfer funds act as a financial assistance to innovative ideas that allows the innovator to create prototypes for further promotion of unique technology. Lack of funding is the main and most serious problem of formation and implementation of the country's innovation infrastructure. Transfer media also contribute to the promotion of innovation by lisence consulting, intellectual property rights protection that is very relevant in the Russian Federation. The impact of transfer agents on the entire system is large due to high level of control and determination the development direction of innovative activity within the country. Most affected by industrial transfers because of development of critical technologies is one of the main instruments of state policy of the Russian Federation in the development of national science and technology.

The main problem hindering the development of innovative sector of the economy is the absence of demand for innovation in the domestic market. The primary objective of demand environment objects is the modernization problem of industrial facilities, the solution of which will stimulate the demand for innovation. Transfer recipients, as main forms of promotion of innovation, must be compatible with other participants of the innovation to create a single innovation infrastructure in the Russian Federation. As of today, only one agency supervises the activities of developing innovation in the country, which is insufficient in connection with a wide variety of technologies and country's size Following infrastructure is able to provide support at all stages of the development of innovations.

Figure 17 – Effective strategy of TT's system



Source: author's own creation

The effectiveness of technology object use is determined using the following parameters:

1. "Out the door" based on the fact that one organization has received the innovation provided by anither;

2. Market impact is estimated by commercial impact, a product, profit and market share change of the innovation technology;

3. Economic development which is assessed by impact of innovation in the regional and national economy;

4. Political reward based on the expectation of political reward flowing from taking part in technology transfer;

5. Opportunity cost which examines not only alternative uses of resources but also possible impacts on other missions of the transfer agent or recipient;

6. Scientific and technical human resources are estimated by the impact of technology transfer on the enhanced scientific and technical skills, technically-relevant social capital, and infrastructure.

In such a way, Russian technology transfer's system has to be guided by the evaluation of the future perspective of technology. For that it is necessary to forecast potential demand and competitiveness. It is also attached great importance to the complex investigation of world high-tech market as important means of formation of producing program and distribution strategy. The first stage of market research is evaluation of the technology prospects in terms of sales volume that guarantees the investment payback and ensuring of production chain.

7.2 External improvement of technology transfer's system

7.2.1 BRICS strategy

Economic cooperations and unions on the high-tech global market occupy a special place. The Czech Republic has a unique opportunity to increase private R&D expenditures and public spending on high-tech and improve the efficiency of innovative infrastructure by virtue of its membership in the EU. Joint technology initiatives, which are created in the fields of innovation, combined public and private players for the implementation of strategic plans into practice. The technology transfer system within the

EU covers almost all areas of scientific research: biotechnology, nanotechnology, information and communication technologies, research in the field of human health, energy, energy efficiency, environment, etc.

When first rotation of the Summits ceased, it was initiated long-term proposals aimed at strengthening economic stability, financial soundness, social stability and the international community in the field of technology and innovation partnership for the development of small and medium businesses of the BRICS countries (UNIDO, BRICS industrial policy, 2015). According to the Czech experience, creating innovative cooperation, technology transfer platform by BRICS countries is an opportunity for enhancing activities in the field of science and high technologes.

Increasing tensions with Western countries, as well as the imposition of sanctions against Russia has led to a number of problems in various spheres of economic activity. One of the most urgent was the termination of the technology transfer of leading Western countries. This placed Russia in a rather vulnerable position, because many domestic science-intensive and high-tech industries dependent on imported technologies. Therefore, for the Russian development of technological and innovation cooperation in the field of innovative technologies with the countries - partners in the BRICS it is particularly relevant. There is a growing BRICS influence on the world economy and politics. Brazil, Russia, India, China and South Africa claim to be the world leaders in the new millennium, and seek to increase its influence on the processes taking place in the international arena.

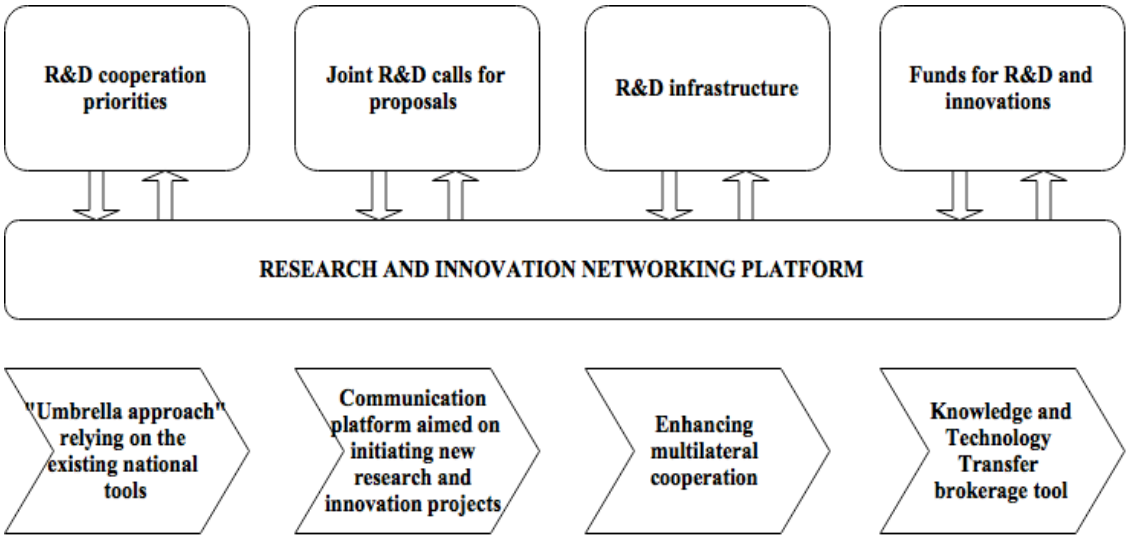
The main objective of BRICS technology transfer is support for innovative and R&D interaction between universities, scientific institutions, industries, SMEs in within the framework of research and innovation networking platform. Networking platform is developed based on country-developed materials, including national industrial development plans, technology development and innovation, analysis of existing platforms and potential participants in the BRICS countries. The networking platform based on 5 industrial blocks:

1. mining, minerals processing, metallurgy, foundry metal and metal fabrication;
2. green technology, waste management, IT and high-tech;
3. efuel, energy efficiency anf renewable resources;
4. infrastructure: transport, energy, water construction (industrial and housing);

5. agro processing, biotechnology, chemical industry manufacturing (UNIDO, Practical experience UNIDO/BRICS, 2015).

Recent economic trends require not only traditional export trade and cooperation, but also to ensure that the equipment, technologies and intellectual services in integrated projects of international industrial partnership. In this case, the R&D networking platform should be in collaboration with all participants of innovative infrastructure.

Figure 18 – S&T and innovation cooperation of BRICS countries



Source: UNIDO, Practical experience UNIDO/BRICS, 2015

In terms of cooperation the BRICS technology transfer should be considered as a part of networking platform. Development of technology transfer platform between BRICS countries is a major factor in the effective stimulation of the formation of international partnerships, innovation and technology transfer between them.

Figure 19 - TECHNOLOGY TRANSFER PROCESS in BRICS countries

BARRIERS	APPROACHES	TOOLS	OUTCOMES	OUTCOMES
Appropriate foreign market partner Limited companyresources Lack of managerialskills Lack of marketknowledge Cultural differences	**Open Innovations** Search of **partners** rather than customers **Support internationali-sation**, not only exports	**BRICS Technology Transfer Network** (IT Platform, network participants,technology brokerage tools, etc.)	Joint venture license agreement Technical cooperation Research cooperation Technical assistance Manufacturing cooperation Services cooperation	Increase in the company turnover New or retained jobs in companies; New products,services, business processes acquired by companies New customers/partners atforeign markets; Access to newmarkets

Source: author's own creation

Thus, at the present time the main element to enhance potential in the field of high-tech is cooperation within the BRICS block. First of all, it's necessary to establish cooperation among the respective Ministries, agencies and organizations responsible for MSMEs, particularly with a view to promoting their mutual exchanges and cooperation for facilitating innovation, technology transfer, R&D, including organization of joint international seminars, forums, conferences, fairs, etc.; There is considerable potential for the increase of high-tech products trade in the framework of association, the implementation of joint investment projects in high technology industries, as well as exchange of experience in the field of improvement of the institutional component of the innovation sphere. Realization of this potential in practice will help to minimize the negative impact of Western sanctions on the Russian economy and sustainable innovation and technological development of the country.

7.2.2 Investment strategy

As of today, the Russian Federation faced difficulties in investment activity of domestic and foreign participants of the investment market. Czech experience has showed that constant investment flow is a major factor determining economic growth. According to Prime Minister Dmitriy Medvedev, the lack of investment is directly correlated to Russian image abroad. He said that Russia is considered as a country with high investment potential by foreign experts but that potential wouldn't be realized for a long time (Forbes, Medvedev: the lack of investment is directly related to the image of Russia abroad, 2012)

Actual problems of development and efficiency upgrading in investment activity show that a significant part of the innovative infrastructure needs a complete replacement of obsolete and outdated equipment at the expense of new investments. That was particularly true of least developed regions such as Adygei Republic, Ingush Republic, Pskov Region and other (Parakniha, Boris, Midler, 2015). In such case, according to Czech experience, the Russian Federation should to develop the selective investment policy providing a complex upgrading of basic assets because of there are 50% of physically obsolete equipment and 99% of obsolete equipment (RBK, Russia needs a

massive renewal of fixed capital, 2013) in Russia. In the framework of selective investment policy, Russia should develop the following forms of investment which provide to generate an appropriate investment market and R&D potential demanding financing for development of scientific base to ensure competitiveness of country's economy:

1. budget allocation at domestic and regional levels;
2. extra-budgetary financing funds;
3. own resources of enterprises including profit, capital allowances and other typer of earnings;
4. financial resources of business: investment and insurance companies, commercial banks and venture funds;
5. conversion credit for R&D and manufacturing organizations;
6. foreign investments of industrial and business companies;
7. expenses of national and foreigh scientific funds;
8. onbank financial institutions such as pension funds, charitable foundations, joint investment finds, govermnet non-commercial organizations etc.

The Russian Federation is the biggest country and consequently there is lack of division of investments between investment authorities and other participants of investment market. As shown Czech experience, investors of innovative activity act as state organizations and structures of regional and local government, intergovernmental and private investors. Every investor has own purposes of investing: if government investment is directed to the basic sciences, academic R&D of infrastructure than private investors attract attention to commercially perspective technologies to avoid confusion in the investment market.

On the basis of analytical studies of Russian innovative infrastructure suggests a conclusion that country hasn't enough domestic investments to meet the all needs of innovative projects and enterprises. Measures aimed at attracting foreign capital lead to introduction of advanced technology and providing a domination of innovative products in the world market. Czech experience has shown that direct foreign investment has a number of advantages in comparison to another types of investments such as it serves as additional capital source for launching the funding of production and transfer technology, reduces the government debt, increases the occupational level and professional skill,

improves the cooperation between technical-scientific and manufacturing companies, constrains the economic growth and improvement of living standards.

7.2.3 IP strategy

For forming IP market on basis of Czech experience, Russia should take following steps to activate the patent and licensing activities and expansion of protected industrial property segment:

1.The development of close cooperation between the state and patent organizations in the provision of material incentives for patent holders, whose developments deserve special attention, ie development that can make a breakthrough in a particular area.

2. Approximation of the development process of new technologies to the real needs of the manufacturing and service sectors. In Russia intellectual property remains unclaimed by the production and the market. In this connection it is necessary to develop cooperation between institutions of science, education and industry, including technology parks, clusters, technology platforms etc., Providing higher technical level created intellectual property, reducing the time and reduce the labor intensity of development. Such cooperation enhances the technical level of the created intellectual property, reduces a time period and labour-intensiveness of development process.

3. Creating the conditions for capitalization (including the value of intangible assets in the current assets of organizations) and exploitation of intellectual property:

- public offering of shares in equity market in order to increase the investment attractiveness;

- tax incentives of intellectual property (from the profit, depreciation, founding capital);

- reduction of taxes in the field of IP transactions

4. Support for SMEs (start-up and spin-off companies), as established in the framework of the Federal Law No. 217-FZ, including:

- the introduction to small business zero rate of income tax (realized capital gain), is directed to the creation of intellectual property, during three years;

- the abolition of taxes on transactions with intellectual property;

- benefits and delay of the payment of patent fees, provided by SMEs as well as individual inventors (entrepreneurs);

- the development of specific forms of financing (venture capital, privileged crediting, leasing operations, microfinance); creating risk insurance systems; provision of guarantees for loans for operating activities, reducing the cost of services guarantee funds;

- formation of state orders for high-tech products and services using the principles of quota share intended for small businesses.

5. Support of the integration processes in the global intellectual property market, export and import of technologies:

- expansion of free consulting and information services in intellectual property protection abroad, exit organizations to foreign knowledge and technology markets are provided by Rospatent;

- the creation and development of special funds to support patenting abroad and exports of technology;

- the creation of tax incentives for the inflow of foreign capital in the R& D sector.

6. Creating a system of effective management of intellectual property in the country, region, industry and enterprise, including the development of a network of organizations and entities of innovation infrastructure involved in promotion of technologies in the market (patent departments, marketing departments, exchange of technology, technology transfer centers, consulting and engineering companies, databases of patents, open source licenses, venture capital funds, etc.). This is about the formation of a new intellectual property management model, which will allow:

- effective use of a variety of useful "functions" of exclusive rights, enhance the activity of the order of intellectual property rights and technology transfer;

- development of mechanisms to support effective information schemes that increase the demand for scientific and technological results;

- strengthen the role of new players in the market, including the intermediaries in the field of intellectual property management.

7. Development of the Intellectual Property Institute of Appraisers.

Assessment of intellectual property - a rather complicated and costly process. In this connection, the simplification of the system and methods of valuation of intellectual property is a prerequisite for the functioning and development of the market.

8. Improving the performance of Rospatent.

Registration of intellectual property and technology transfer agreements allows Rospatent provide information and consulting services. With specialists in the field of patents, Rospatent may also perform services for patent research with the provision of discounts to small businesses, to provide assistance for the organization of participation in international scientific and technological exhibitions provide benefits on payment of fees for registration and protection of intellectual property. Particular attention should be paid to the system of examination of patent applications, control of the technical level of patentable inventions, and others. Intellectual property.

9. Creating a statistical system for monitoring market development, capitalization and exploitation of intellectual property.

The presence of complete, systematically updated, comprehensive information on the establishment of the results of intellectual activity (output) and the financial results of their use (outcome) is an important tool for the management of intellectual property market development in the country.

10. Legislative provision of the intellectual property market.

The further development of intellectual property law, in particular the clarification and addition of Federal Law №217-FZ, the development of regulations, regulatory documents aimed at improving, deepening and improving the efficiency of legal regulation in the sphere of intellectual property on a number of areas listed below, in particular:

- requiring government customers and implementing procedures for the detection of patentability of intellectual activity, obtained at the expense of budget funds;
- requiring government customers for the patentability of research results of the evaluation procedures and development at the stage of placing the state order and the acceptance of the results
- the introduction of conditions, the size and procedure of payment of remuneration to authors for the development and commercialization of innovation
- creation of a system of registration of information about innovations, created

at the expense of budget funds, sufficient to identify the content of the data results in order to avoid duplication of R&D and others.

11. The development of the protection of intellectual property rights system, including the establishment of effective judicial protection of intellectual property system, ensuring the quality of patent lawsuits.

12. Increased participation of universities in training and retraining in the field of intellectual property, engaging in economic circulation and commercialization of technology and technical services:

- introduction into the curriculum, particularly for technical and natural specialties, disciplines related to intellectual property and technology transfer, intellectual property, marketing, innovation management, etc .;

- training and retraining of specialists in the field of intellectual property - appraisers, patent attorneys, marketers, accountants;

- development of integration processes of university science and production sphere.

The above ways of improving the system of creation, protection and utilization of scientific and technological activities can form the basis of intellectual property development strategy in Russia, the development and adoption of which is extremely relevant to the country in connection with the processes of formation of the NIS and in the light of accession to the World Trade Organization.

8 Results of research findings

In this paper has been used a number of methods and analytical tools for the analysis and evaluation of the technology transfer's system of the Czech Republic and the Russian Federation. In order to substantiate the hypothesis it's necessary to achieve stated sub-goals:

1. Overall analysis of the origin of the TT process.

Today TT is an effective tool for implementing the national innovation policy in the framework of the modernization of the country. It stimulates the development and improvement of such elements of the innovation infrastructure as an intellectual organization, virtual corporation, market-intelligent enterprise, TT centers, innovation and technology centers, technology platforms, innovation consulting etc.

2. Study the innovational infrastructure and technology transfer system of the Czech Republic.

The experience of most foreign countries testifies to the need for the main components of technology transfer infrastructure: legislative governing the activity of technology transfer; financial support both from the government and from the private sector; experienced and qualified personnel. The Czech Republic has considerable experience in the management of innovation and TT, which is evidence of high indicators of innovation activity. Czech technology transfer' system is under the public administration and regulated by alliance which ensures coordination of innovation activities in all directions. The alliance is large-scale association that combines public and commercial organizations, R&D agencies and patented agencies for data processing and transfer of technologies into a unified federal system.

3. Consider the role and place of technology transfer in innovational economy in the Russian Federation.

In Russia TT should be considered as one of the main mechanisms for the link between science and production, which should be carried out by professional managers who work in specialized institutions. At present in Russia has a rather wide centers Technology Transfer Network , innovation and technology centers, business incubators and other organizations that promote the formation of a horizontal linkages between educational and research institutions, industry, and vertical links between the municipal,

regional and federal levels of innovation management, and thereby implementing innovative mediation institute.

4. Indicate the main problems and disadvantages of Russian technology transfer functioning.

In Russia, there is no centralized balanced innovation policy that leads to the fact that the processes of technology transfer carried are not effective enough. Technology transfer's infrastructure of the Russian Federation and its regions characterized by a lack of investment resources, in spite of all attempts by the government to address this issue through the creation of public funds and the development of public-private partnership. Remains undeveloped "non-traditional" investment mechanisms and tools of innovation used in the world practice. This situation is explained by the lack of a transparent and convenient for investors of innovative infrastructure model. In addition, government regulations, patent incentives, legal framework, regulating investment activities in the innovation processes in the Russian Federation do not allow actively develop the tools of innovative development.

5. Develop a strategic plan for effective execution and expansion of Russian technology transfer system based on experience of the Czech Republic.

Today in Russia the processes of transfer and commercialization of technologies are not sufficiently effective, poorly controlled, more expensive and do not provide a regular improvement of industrial enterprises innovation. The TT should focus on such internal improvements as creation of cooperation between science and business sector, regulation of legislative acts, integration of the Russian and European TT, creation of venture capital network, development of investment and IP conditions for implementation of technological innovations etc.

For wide distribution of new production technologies in the innovation economy is necessary to create cooperation of technology transfer with state support, as done in the Czech Republic. In the absence of an alliance in Russia the technology transfer is often performed spontaneously, that does not meet the modern requirements of a competitive economy. On the world stage in recent years international integration transformations gain more and more weight, which gradually transformed into independent political and economic structures. Among them a special place is taken by the EU, which is the global political, economic and scientific community. Within such a framework of technology

transfer processes are balanced and focused on the continued strengthening and growth.

The Russian Federation ia a participant of association of five major emerging national economies BRICS, which have the necessary tools to build cooperation in all sectors of industry and to solve practical problems identified by the strategy of economic partnership association of countries. In terms of cooperation the BRICS technology transfer should be considered as a part of networking platform, the main purpose of which government regulation and prospects for development of technology transfer, incentive mechanism of private investment and inter-sectoral cooperation in the framework of a technological platform, the formation of high-tech sectors, and addressing the priority tasks the energy and the industry of Russia and other BRICS countries.

6. Overview and appraise the perspective development of technology transfers in the Russian Federation.

Availability of the system of transfer of technology and high-tech industries in Russia creates conditions for:

- ensure technological leadership for a number of key areas;
- formation of a complex of high-tech industries and the expansion of positions in the world markets of high technology products;
- increase Russia's strategic presence in the markets of high-tech products and intellectual services;
- the upgrading of traditional industries, including through the deployment of globally oriented specialized production.

At the same time, the lag in the development of new latest generation technologies may reduce the competitiveness of the Russian economy, as well as increase its vulnerability to rising geopolitical rivalry.

9 Conclusion

The problem of transition to innovative way of development is the main issue of today's domestic and foreign policy of Russia. Numerous attempts being made at the state level over the last 10 years did not bring the expected results - the country has not been able to restore its former power and become one of the world's technological leaders, scientific and technological potential continues to decrease, the quality of life is much lower than in G8 countries and so on.

At the present stage of Russia's development one of the main problems is the transition from an industrial, raw materials export economy to the "knowledge economy", "innovation economy" based on the intellectual resources, high-tech and information technology. The most important characteristic of the modern world economy is the intensification of innovative processes, representing a sequence of actions aimed at converting scientific knowledge into new products and materials, new technologies, new forms of organization and management, and bring them to practical use in order to obtain the effect. The annual turnover of innovative technologies and science-intensive products on the world market, according to the Russian Academy of Sciences, is currently about three trillion. US dollars. By 2016, the market turnover of high-tech products could rise to 4-4.5 trillion. Dollars (Development Programm of innovative activity of the Russian Academy of Sciences, 2015)

One of the main mechanisms for the restructuring of the Russian economy, its modernization and sustainable lift is the TT system because it creates the necessary conditions and prerequisites for economic transition to its new technological order, provides an innovative type of economic growth. Technology transfer, as well as the innovation process as a whole, flows at the current stage of development of the world economy is not in isolation but as part of NISs, subject to high internationalization under the influence of globalization trends and emerging supranational and global innovation systems. Relevance of the research is enhanced by the fact that in the history of the world economy for the first time there is a transition to the next technological way in the context of globalization, initiating timing of technological changes.

In conclusion, following should be noted, an innovative way of economic development accepted in modern globalized world is impossible without familiarizing with high technology, including - of information and communication. Their standard

specifies a system of international competition, stimulating not only the exchange of goods, and technical progress. Slow adaptation of new ideas and further slow the introduction of new technologies is not left to chance in the Russian minimum benefits among foreign countries. Being outside systems, Russia condemns himself to self-isolation, technological backwardness, strengthening the raw material orientation, conservation management forms unsuitable in market conditions. Despite the fact that national security is becoming increasingly dependent on technology security, which determined by the state of the economy as a whole, not just exporting industries. In order to narrow the gap with high-tech industries, to introduce technological innovations to Russian enterprises are now required. And technology transfer could be one of the most effective mechanisms of this process.

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8. Electronic Association of the Czech Republic. Official website: http://www.electroindustry.cz/DefaultEN.aspx

9. Export Guarantee and Insurance Corporation. Official website: http://www.egap.cz/index-en.php

10. Czech Export Bank. Official website: https://www.ceb.cz/en/

11. Czech Invest. Official website: http://www.czechinvest.org/en

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19. South Moravian Innovation Centre. Official website: https://www.jic.cz/en/about-us/

Brno Cluster

1. Technology Transfer Office in Brno University of Technology. Official website: https://www.vutbr.cz/en/ctt

2. Technology Transfer Office of Masaryk University (TTO). Official website: http://www.ctt.muni.cz/en

3. Center of Technology transfer in Mendel University in Brno. Official website: http://mendelu.cz/en/26409-Pracoviste?pracoviste=222

4. South Moravian Innovation. Official website: https://www.jic.cz/en/

Czech energy technology transfer cooperation

1. Energy Research Centre. Official website: www.vec.vsb.cz

2. Centre for Research and Utilization of Renewable Energy (CVVOZE). Official website: www.cvvoze.cz

3. University Centre for Energy Efficient Buildings (UCEEB). Official website: www.uceeb.cz

4. Regional Innovation Centre for Electrical Engineering. Official website: www.rice.zcu.cz

5. Nupharo Park. Official website: www.nupharo.com

6. Hydraulic Laboratory. Official website: www.cbe.eu

7. Alternative Drive Units and Fuels Laboratory. Official website: www.elapp.cz

8. Czech Centre of Intelligent Power Engineering. Official website: www.cie-trinec.cz

Czech cooperation of business incubators

1. VUT Technology Incubator. Official website: www.jic.cz
2. CZU University Point One. Official website: http://pointone.czu.cz
3. Business Incubator of the Palacký University Science and Technology Park in Olomouc. Official website: www.vtpup.cz
4. BIC Ostrava. Official website: www.bicova.cz
5. Zlín Technology and Innovation Centre. Official website: www-ticzlin.cz
6. Nové Hrady Academic and University Centre. Official website: www.greentech.cz
7. Třeboň Innovation Centre. Official website: www.tic.trebon.cz
8. Ostrava Science and Technology Park. Official website: www.vtpo.cz
9. BIC Plzeň. Official website: www.bic.cz
10. North Bohemia Business and Innovation Centre. Official website: www.vuhu.cz
11. ČVUT Technology and Innovation Centre. Official website: www.tic.cvut.cz

Russian support cooperation of innovation business undertakings

1. Russian Corporation of Nanotechnologies. Official website: http://www.rusnano.com
2. Development fund of support for small enterprises. Official website: http://www.fasie.ru
3. «Skolkovo». Official website: http://innovation.gov.ru/node/3490

Russian network of bustiness-angels

1. The National Union of business angels. Official website: http://russba.ru/
2. National association of business angels. Official website: http://rusangels.ru
3. National network of business angels **"**Private capital". Official website: http://www.private-capital.ru
4. Association of business angels "Start investment". Official website: http://www.start-invest.ru/bit.php

Russian TT Cooperation

Transfer funds

1. Russian Venture Company (RVK). Official website: http://www.rusventure.ru/en/

2. SBT Venture (SberBank Venture Capital). Official website: https://www.rusventure.ru/ru/

3. National association for business angels. Official website: http://rusangels.ru

4. The Russian Agency for Export Credit and Investment Insurance (EXIAR). Official website: https://www.exiar.ru/en/

5. Vnesheconombank. Official website: http://www.veb.ru

Transfer media

1. Federal Service for Intellectual Property (ROSPATENT). Official website: http://www.rupto.ru/rupto/portal/start

Transfer agents

1. The Technology Agency of the Russian Federation. Official website:http://rta.gov.ru

2. Russian Academy of Sciences. Official website: http://www.ras.ru/index.aspx

3. Foundation for Advanced Studies. Official website: http://fpi.gov.ru

4. Foundation for Assistance to Small Innovative Enterprises in the scientific and technical sphere. Official website: http://www.fasie.ru

5. Innovative Entrepreneurship Development Fund. Official website: http://www.ibdf.ru/index.htm

6. Association of public research centers "SCIENCE". Official website: http://agnc.ru

7. The Association of of innovative regions of Russia. Official website: http://www.i-regions.org

Industrial transfers

1. RUSNANO. Official website: http://www.rusnano.com

2. The National Association of innovation and development of information technology. Official website: http://www.nair-it.ru

3. The Russian Association for Electronic Communications (RAEC). Official

website: http://raec.ru

4. Union of Composites Manufactures. Official website: http://www.english.uncm.ru

5. ROSATOM. Official website: http://www.rosatom.ru

6. Information & Computer Technologies Industry Association (APKIT). Official website: http://www.apkit.ru

Demand environment

1. Ministry of Foreign Affairs of the Russian Federation. Official website: http://www.mid.ru/home

2. Chamber of Commerce and Industry of the Russian Federation. Official website: http://tpprf.ru/ru/

3. Ministry of Industry and Trade of the Russian Federation. Official website: http://minpromtorg.gov.ru

4. The Russian Association of Small and Medium Enterprises. Official website:http://moscow.ru/economy_business/business_communities/business_entrepreneurship/

Transfer recipients

1. Skolkovo. Official website: http://sk.ru/news/

2. Russian technology transfer network. Official website: http://www.rttn.ru

3. The Center for Strategic Research Foundation. Official website: http://csr.ru

4. International Association of scientific parks. Official website: http://nptechnopark.ru/about/

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